

FLIGHT

The
AIRCRAFT
ENGINEER
&
AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

1922.	
Dec. 15-	
Jan. 2	Paris Aero Exhibition
1923.	
Jan. 3	F.A.I. Paris Conference
Jan. 12	Lecture, "Seaplane for Commercial Duties," by Maj. D. C. M. Hume, before I.Ae.E.
Jan. 26	Lecture, "Wind Tunnel Work at the N.P.L.," by W. L. Cowley, before I.Ae.E.
Feb. 6-7	Third Air Conference at the Guildhall
Feb. 9	Lecture, "Seaplane Design," by W. O. Manning, before I.Ae.E.
Feb. 23	Lecture, "Aerofoils," by Dr. A. P. Thurston, before I.Ae.E.
Mar. 15	Entries close for Dutch Height Indicator Competition.
Apr. 12	Lecture, "Some Controversial Points in Aircraft Design," by F. T. Hill, before I.Ae.E.
May 11	Lecture, "Experimental Flying," by Maj. M. E. A. Wright, before I.Ae.E.
June	International Air Congress, London
Dec. 1	Entries close for French Aero Engine Competition.

EDITORIAL COMMENT.



JUDGING by the exhibits at the Paris Aero Show, the Duralumin age has been reached in France. A surprising number of the machines exhibited are built either largely or entirely of this metal. The reasons for this tremendous increase in metal construction, and preference for Duralumin, are several, and as the use of Duralumin has never been the vogue at home, a few remarks on the causes, such as they appear to a student of French aviation, may be of assistance.

First, as regards the use of metal construction, France has a tremendous belief in the possibilities of aviation generally, and Colonial aviation in particular. Climatic conditions in the majority of the French Colonies are such that the ordinary wood construction is likely to suffer, and as Colonial aviation is looked upon as one of the most fruitful directions in which aviation can develop, the problem of using metal in place of wood becomes an intensely practical one, and not of the rather academic interest which we in this country accord it.

Now, although it is not, perhaps, generally realised in England, France does not produce the special steels, at any rate in sufficiently thin sheets, which are required for all-steel aircraft construction. If the steels have to be imported, the price becomes so excessive as to make it cheaper to use Duralumin. Then there is the further advantage that Duralumin can be used in much thicker sections, which is merely another way of saying that it is easier to make a machine of Duralumin than of steel. Consequently, although Duralumin construction is dear (there is probably not a single metal machine in the Show which can be regarded as a commercial proposition), it is chosen in France in preference to steel, which would be dearer still and more difficult. At the same time, French constructors are getting a great deal of experience in metal constructions, and this is not confined to one or two firms, but is being taken up seriously by a very large proportion of the constructors. As to whether or not French methods agree with our ideas does not greatly matter. What does matter is the evident determination to progress, of which there is so much evidence at the Show.

Popularity of the Schoukowsky Aerofoil

Another very noticeable feature of this year's Salon is the increasing popularity of the Schoukowsky type of aerofoil, or Göttingen section, as it is now usually called. This section is to be found not only on monoplanes of the cantilever type, but also on more than one biplane. Whether the latter application is wise is, perhaps, open to discussion, as it would appear to be difficult to save sufficient weight in the wing structure to make up for the relatively higher resistance of this section plus wing bracing. Theoretically a very light wing structure should result.

Commercial Aeroplanes or Troop Carriers?

Going through the list of "commercial" machines at the Show, it is not possible to discover traces of any tendency to attempt improvements in economy; 60, 70, or even 80 h.p. per passenger carried is still cheerfully expended, and one cannot help wondering whether France has lost faith in aviation as a commercial possibility, and all the so-called "commercial" machines are in reality camouflaged troop-carriers: if not the actual machines, then at any rate the general type which they represent. Otherwise one fails to understand the continued production of machines which, excellent though they may be, regarded as aeroplanes, could never hope to pay their way without heavy Government subsidies.

Superchargers

One field in which France is going ahead, probably ahead of the rest of the world, is in the matter of supercharged engines. The Rateau turbo-compressor no longer seems to be the laboratory experiment it used to be, and a number of machines are being fitted with supercharged engines. So much is this the case that several machines at the Show are stated to be designed specially for high-altitude work. Combined with a variable pitch airscrew the supercharger allows of very considerable increases both in ceiling and in speed at great heights. M. Louis Breguet has visualised the possibility of realising what appears to us now quite phantastic speeds, and their application to commercial aircraft. While these may be regarded as dreams of future achievement, the application to military aircraft is a matter of

immediate concern. One is tempted by this activity on the part of France to ask: What are we doing? Has our Air Ministry sent out specifications for machines to be used habitually at altitudes at or above 30,000 ft.? Are we allowing ourselves to be outdistanced in this particular sphere, and thus becoming inferior to any nation which likes to take the trouble of providing itself with a small fleet of machines capable of "sitting" about at a height which our machines cannot reach, excellent though they be at lower levels. We do not for one moment suggest, of course, that France is a menace to us. That would be unthinkable. But we do maintain that this country cannot, must not, lag behind in any single development which makes for superiority in the air. Do not let us forget that during the last war the pilot who could reach an altitude slightly greater than that of his adversary always had the whip hand. He could give battle when and where he chose to, and he could rest immune if he did not wish to fight. A hundred aeroplanes capable of reaching 40,000 ft. would be more than a match for ten times that number of machines whose ceiling was 30,000 ft. While the latter were staggering around near their ceiling, the former would be able to manœuvre with a considerable reserve of power, and could outclimb the others whenever they chose. Do not let us be lulled into a false sense of security by the fact that the supercharger is not yet all that it might be. It is gradually being improved, and it will not do for us to be outdistanced.

In conclusion, we would like to thank the organisers of the French Aero Show, the Chambre Syndicale des Industries Aéronautiques (which corresponds to our S.B.A.C.) for granting us the necessary permits to enable us to compile a very full report on the exhibition, and for their unfailing courtesy in rendering every assistance in their power in order to facilitate our work.

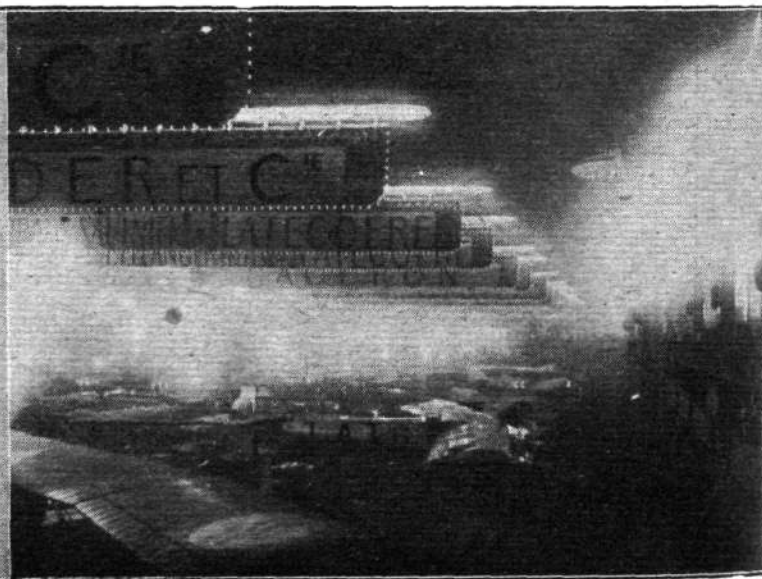
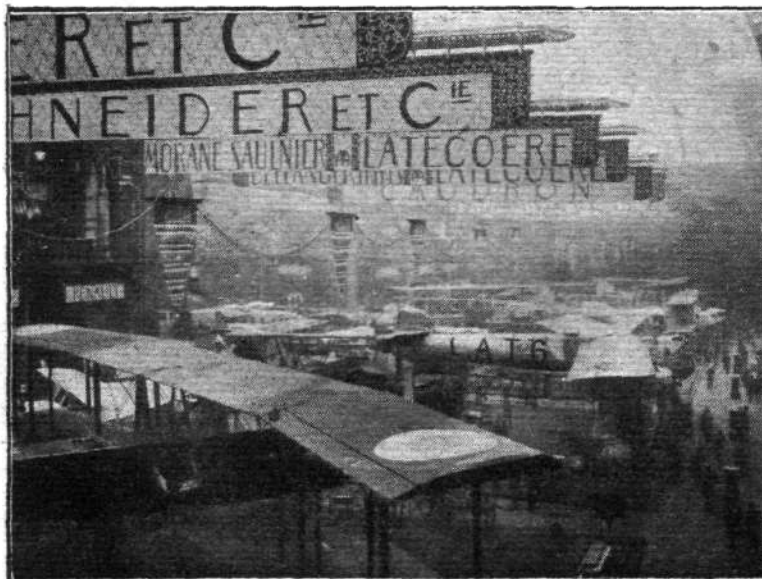
FLIGHT

AT THE PARIS AERO SALON.

FLIGHT Stand is at the Exhibit of M. Branger, where FLIGHT can be obtained, and where all communications, Editorial or Advertisement, can be addressed.

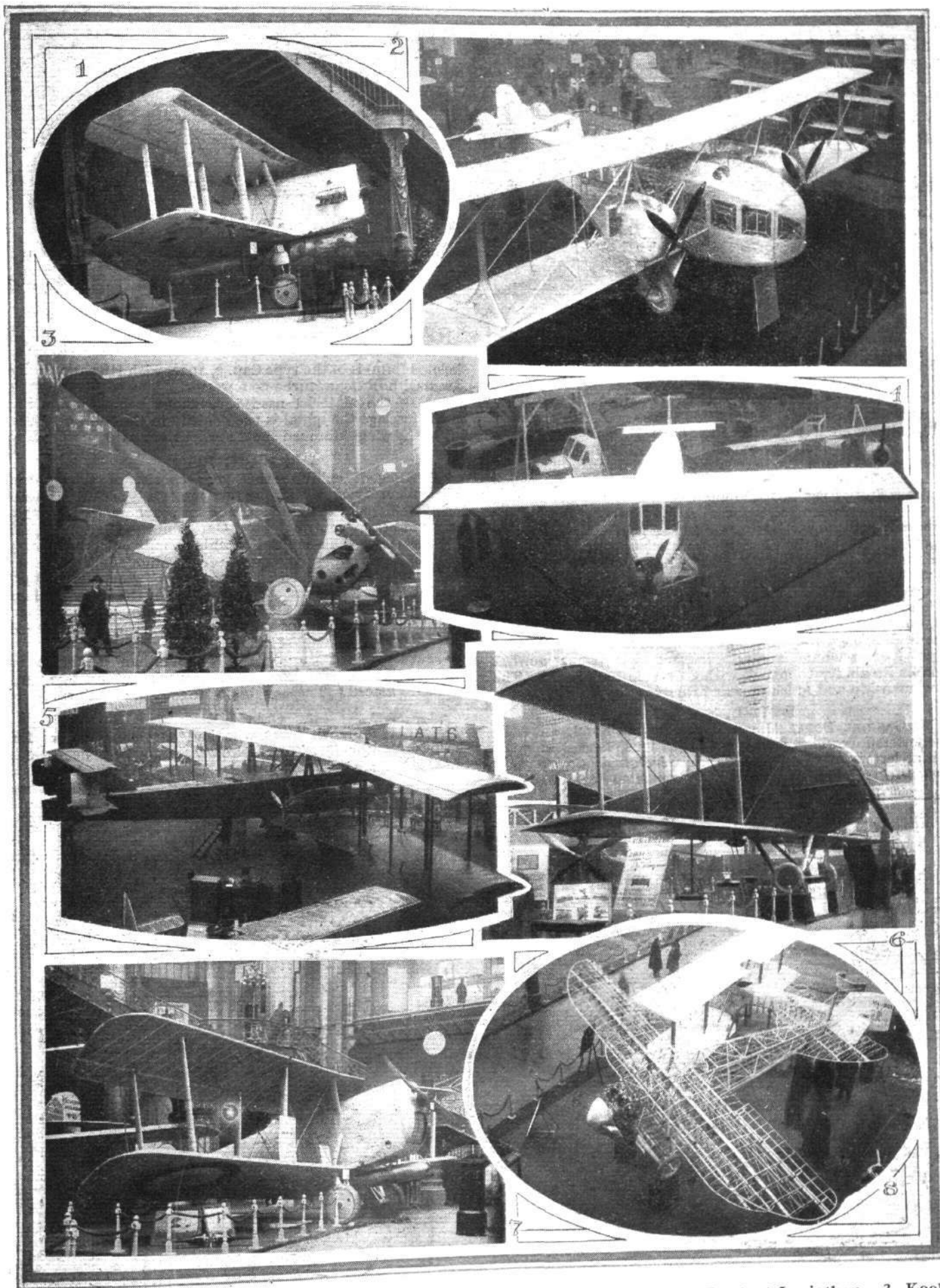
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THE PARIS SALON: General views, by night and by day.

THE PARIS SALON



THE PARIS SALON : Some of the machines. 1, Handley Page "Hanley." 2, Breguet Leviathan. 3, Koolhoven F.K.31. 4, Morane. 5, Schneider (4-eng.) Bomber. 6, Farman Bomber. 7, Pierre Levasseur Torpedo plane. 8, Hanriot All-metal.



Preliminary Report

BELLANGER FRÈRES

A NEW-COMER to the Paris Aero Show is the firm of Bellanger Frères, who are exhibiting a twin-engined flying boat, designed by Denhaut. In addition to the complete machine, which, it is stated, is "*destiné à la Marine Nationale*," a similar hull is shown which presumably is intended for commercial work, as it has a "conservatory" cabin top added.

The flying boat is characterised by a peculiar mounting and cowling of the Hispano engines, which are placed high in the gap between the planes, and as close together as the propellers will allow. This arrangement is, of course, adopted in order to reduce the turning couple set up when one engine stops. The hull of the machine is flat-sided, but the wing roots of the lower plane are rounded into the sides. There is a Vee bottom but no step.

The wings are of approximately crescent-shaped plan form, or, more correctly speaking, the trailing edge is straight and the leading edge swept back in a long curve to meet it at the tips. The machine is nicely finished, but one somewhat doubts its ability to get off without a step to assist it. The workmanship and finish appear to be very good.

BOREL, S.C.I.M.

M. GABRIEL BOREL this year appears as Borel, S.C.I.M., the letters following the name of the famous pioneer being the initial letters of the firm: *Société Générale de Constructions Industrielles et Mécaniques*. The machine exhibited (in

skeleton form) is of the type Cap. 2, 1922, with Hispano engine fitted with Rateau turbo-compressor. The construction is all-metal, the material used throughout being Duralumin. In the fuselage the metal is used chiefly in the form of tubes, but in the wings stamped sheet sections are used.

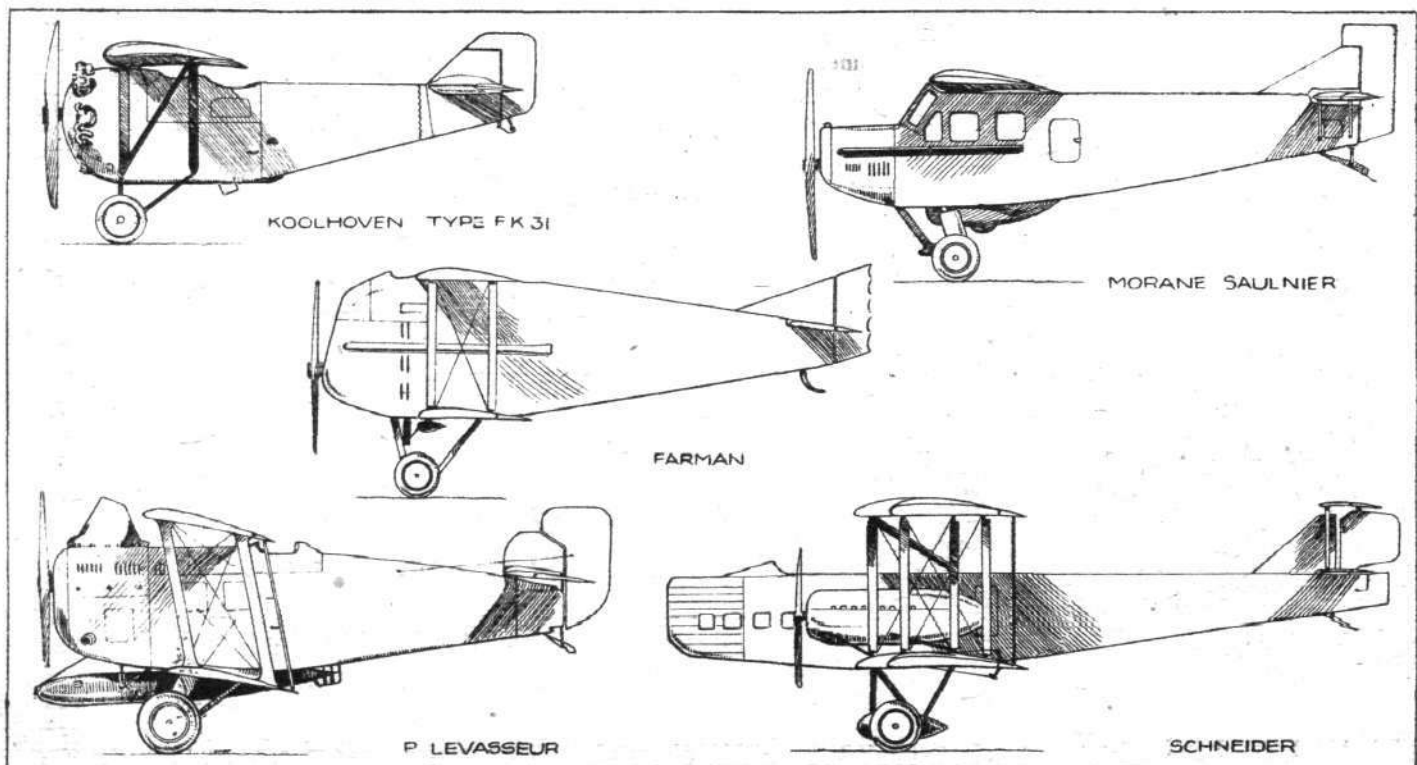
L. BREGUET

THE Breguet exhibits this year consist of a complete "Leviathan" type XXII, the fuselage of a type XX "Leviathan," and one of the old type 14T bis seaplane, fitted with a large and beamy central float of Duralumin. The type XXII is a very large twin-engined machine, built entirely (except for the fabric wing covering) of Duralumin. The power plant, when fitted, will consist of two of the "groupe bimoteur" Breguet-Bugatti engines. The covering of the huge fuselage is the same as that of the Sesquiplan shown last year, and consists of narrow strips of Duralumin, with edges turned inward to form channel sections.

The fuselage of the type XX Leviathan is shown in skeleton. It is a very pretty piece of work, but must be very expensive indeed. The 14T bis is already well known.

C.A.M.S.

AMONG the French firms who had entered machines for the "Coppa Schneider" at Naples was, it may be remembered, the Chantiers Aéro-Maritimes de la Seine, of which Mr. D. Lawrence Santoni is *administrateur-délégué*. This firm has not



SILHOUETTES FROM THE PARIS SALON: Five interesting types.

been in existence more than a year or so, and has already produced several types of flying boats. The designer is M. Conflenti, who was with Mr. Santoni on the Savoia firm. The machine exhibited is a two-seater flying-boat school 'bus, with a Hispano engine mounted in a neat little power "egg." Large photos. of other types are also shown.

CAUDRON

NUMERICALLY the Caudron exhibits are the largest in the Show, no fewer than six types of Caudrons being represented. While most other manufacturers have given up making sporting aeroplanes, Caudrons are showing at least two which fall under that category, while two more, or even three, can be regarded as such, although intended primarily for school work. The sixth machine exhibited is the three-engined commercial passenger carrier shown last year, but incorporating several improvements.

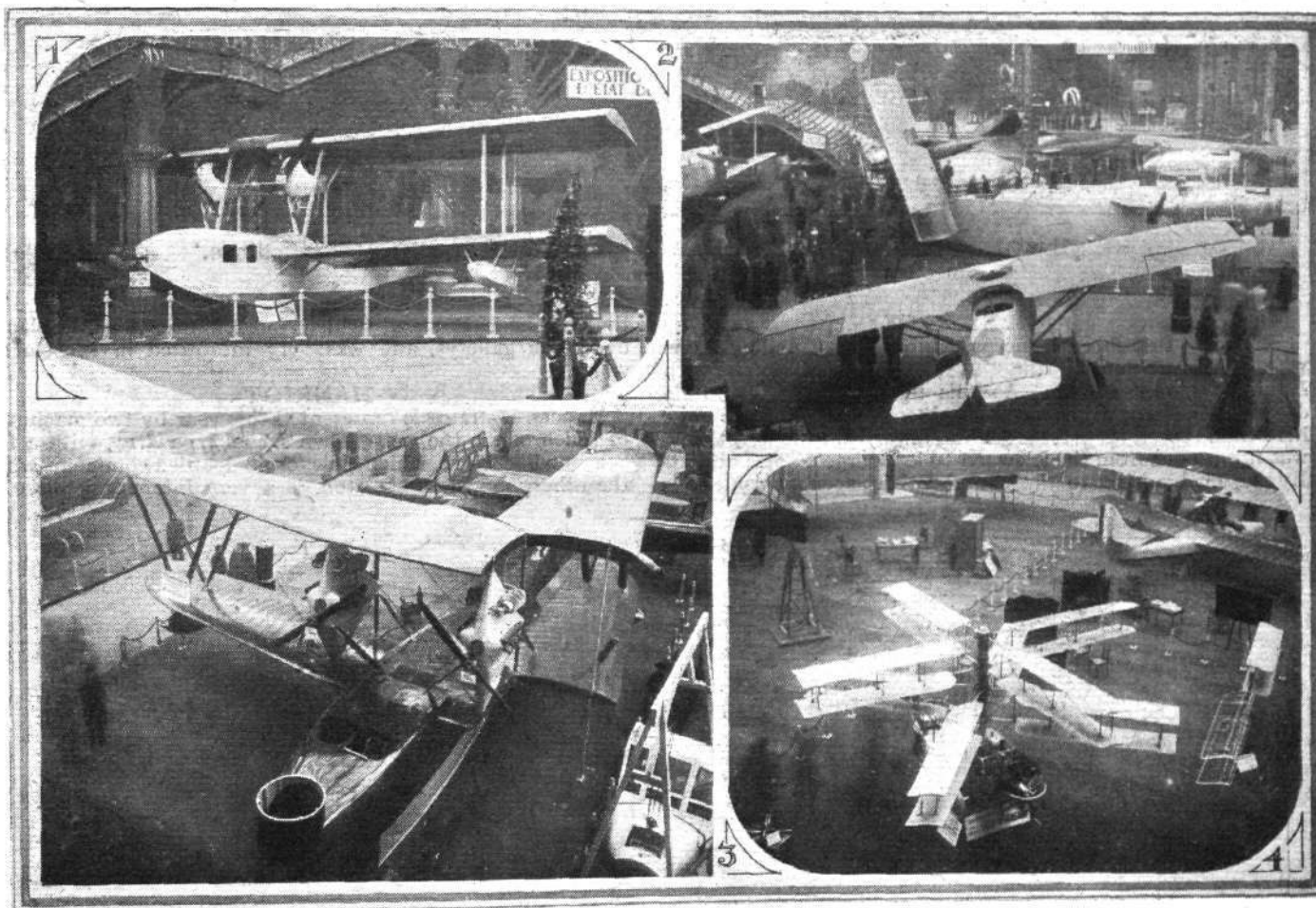
The C.61, as the passenger machine is called, is driven by three Hispano engines, two of which are mounted on struts

FARMAN

HENRY AND MAURICE FARMAN show three machines this year, neither of which has been exhibited before. One of these, the largest, is a "commercial" passenger carrier, and may be described as a "Goliath" with the two Salmson engines removed from the wings and a 600 h.p. Farman engine placed in the nose of the fuselage instead. The cabin seats eight passengers, but a power expenditure of 75 h.p. per passenger can scarcely be regarded as a commercial proposition.

The second Farman is a day bomber with very deep fuselage, and the pilot and gunner placed respectively in front of and behind the top plane. The nose of the fuselage is rounded off, as the radiator is carried under the fuselage, just behind the front struts of the undercarriage.

By far the most interesting of the Farman machines is a monoplane two-seater, with the highly tapered, thick cantilever wing placed low on the fuselage, and pilot and passenger



THE PARIS SALON : Some of the machines. 1, Loire and Olivier flying boat, which has two engines. 2, The Nieuport stand, showing the fuselage of the large cabin machine, and, in foreground, the Koolhoven F.K.31. 3, Bellanger twin-engine flying boat, which has folding wings of crescent-shaped plan form. 4, Pescara Helicopter.

between the wings, and the third in the nose of the fuselage. The main improvement, and one which was suggested in FLIGHT last year, consists in removing the petrol tanks from the cabin (where they were placed under the passengers' seats) and building them into the centre section of the top plane. This should materially lessen the danger to passengers of fire on board, and at the same time has the advantage of giving gravity petrol feed to the engines.

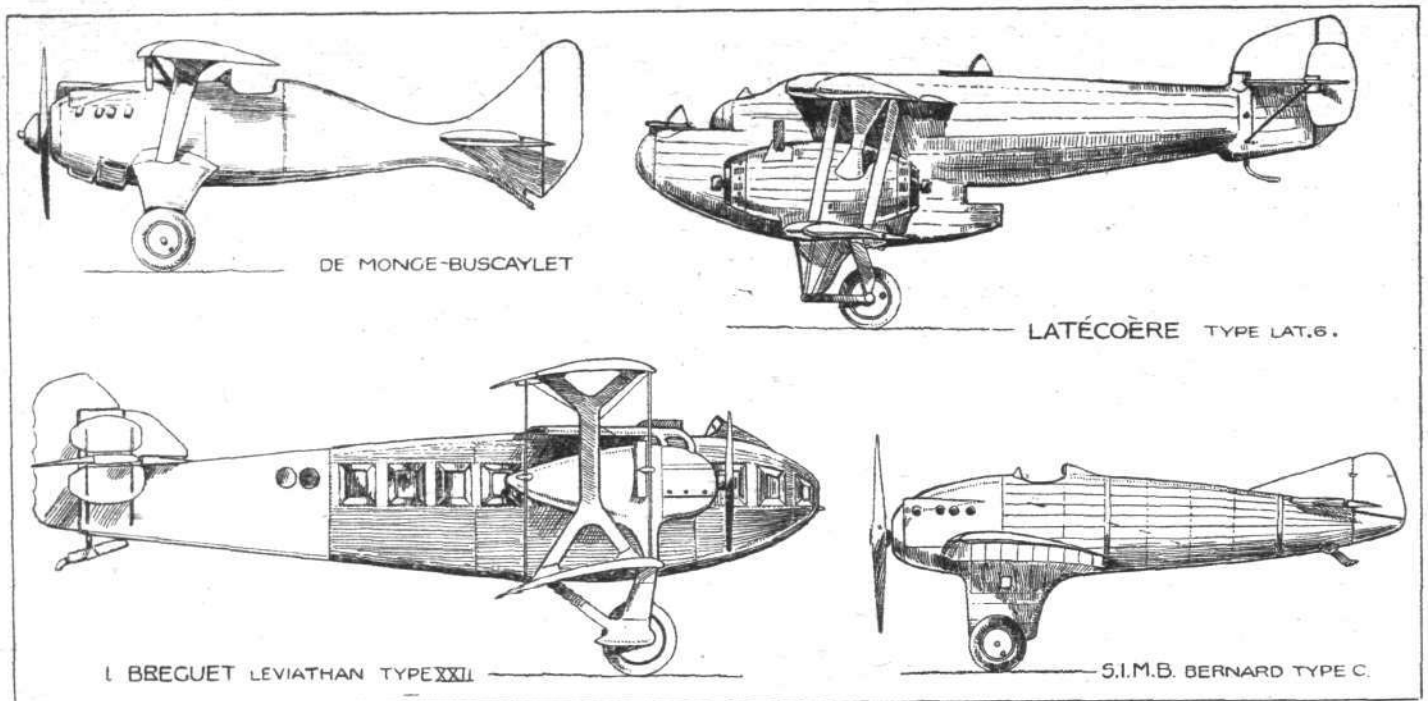
The two sports type Caudrons are a single-seater (type C.67) with 30 h.p. inverted Y-type Anzani engine, and a two-seater (C.68) with 45 h.p. six-cylinder Anzani. The wings of the latter are made to fold, and the machine can then be trailed behind a motor-car, or even a motor-cycle.

Three school machines are shown, representing various stages in the tuition of flying. The first is the famous G.3, with tail booms and skids. The second is a type C.27 two-seater fuselage biplane with 16 Rhone engine, and the third a two-seater with Hispano motor. Thus the pupil gradually works up from the G.3 to the standard tractor biplane with water-cooled engine.

enclosed in a "conservatory" cabin. The chassis is similar to that of the B.A.T. "Bantam," giving a very wide track. An objection to this arrangement in the Farman monoplane is that landing shocks are taken by the cantilever wings. However, the depth of these at the root must be close upon 2 ft. It appears that the occupants enter and leave the cabin by walking along the root of the wings from the trailing edge, and the only support appears to be the exhaust pipe, which might conceivably give the adventurous passengers a shock.

F.B.A.

THE Franco-British Aviation Co. are showing a type 16 H.E.2 flying-boat intermediate school machine. The 140 h.p. Hispano engine rests on a pair of "trouser" struts rising from the deck of the boat hull, and a semicircular radiator curves over the nose of the power "egg." Instructor and pupil sit side by side in front of the wings. The boat is flat-bottomed and has but a single step. In its general design the machine follows lines which are now more or less familiar.



SILHOUETTES FROM THE PARIS SALON : Four all-metal machines.

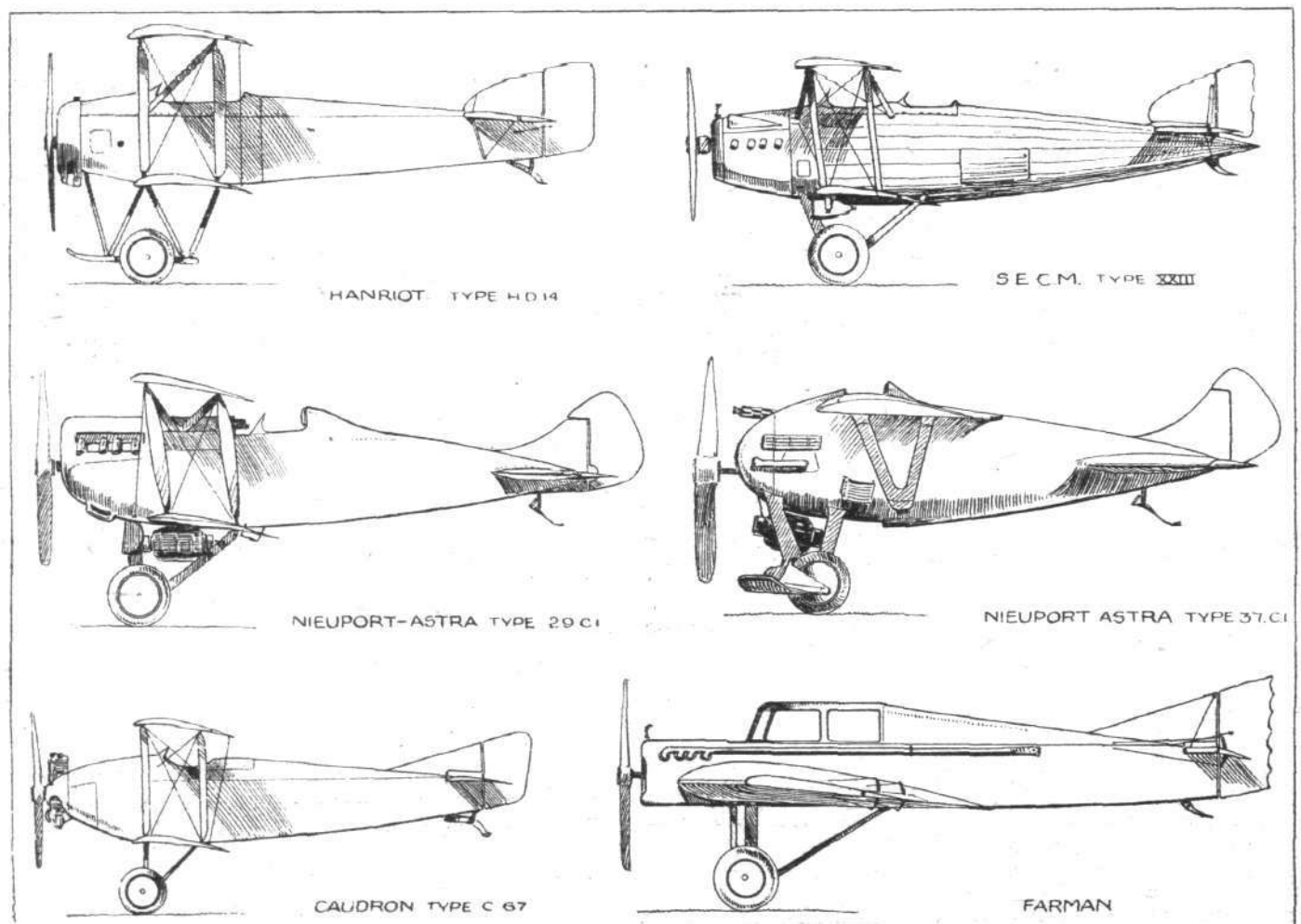
HANDLEY PAGE

THE only British constructor exhibiting is Handley Page, who is represented by the "Hanley" torpedo-plane with Napier "Lion" engine. As this machine was very fully described in *FLIGHT* quite recently, there is no need to do more here than record its presence at the Show, and the fact that it was flown over from Cricklewood to le Bourget. M. Laurent-Eynac, on his visit to the Grand Palais, spent considerable

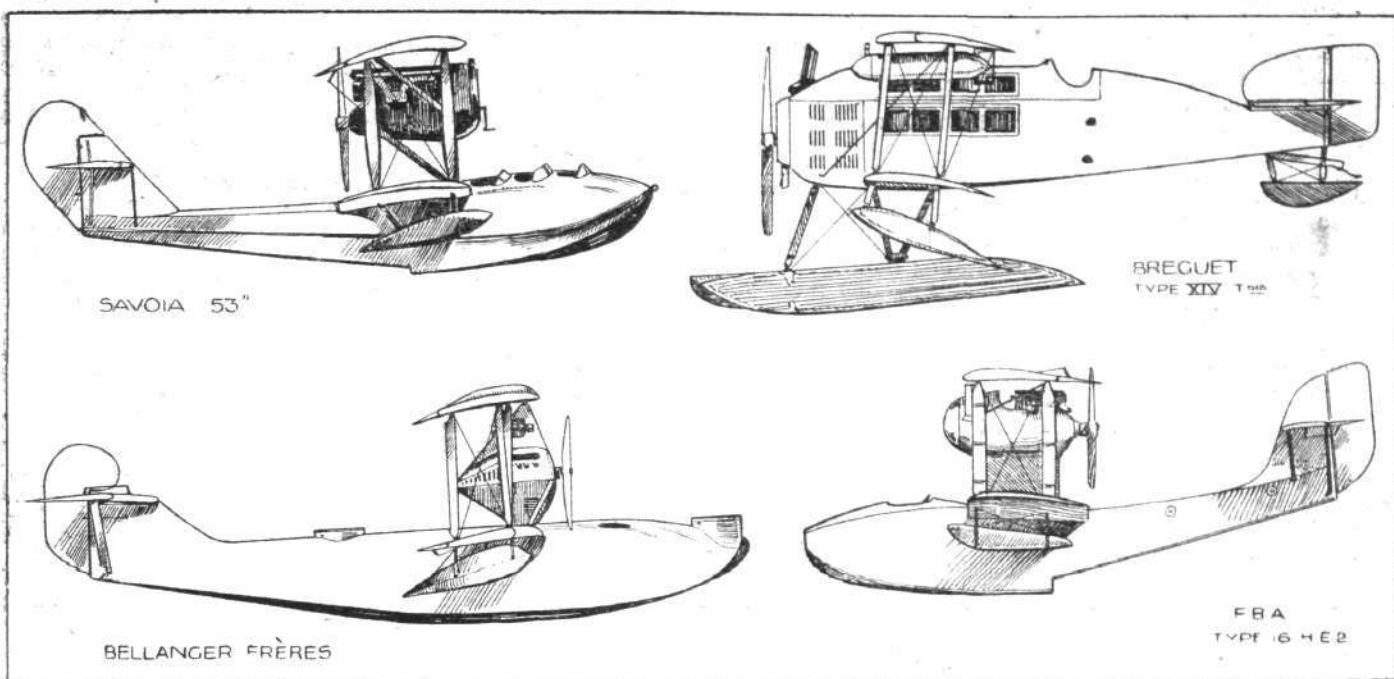
time on the H.P. stand (which, incidentally, is badly placed under the gallery), and was very interested in the slotted wings.

HANRIOT

MARCEL HANRIOT is represented this year by two machines, of which one is the well-known school type H.14, with a few 1923 modifications, which calls for no detailed comment, while the other, shown in skeleton, is a very interesting piece of



SILHOUETTES FROM THE PARIS SALON : Some of the smaller machines.

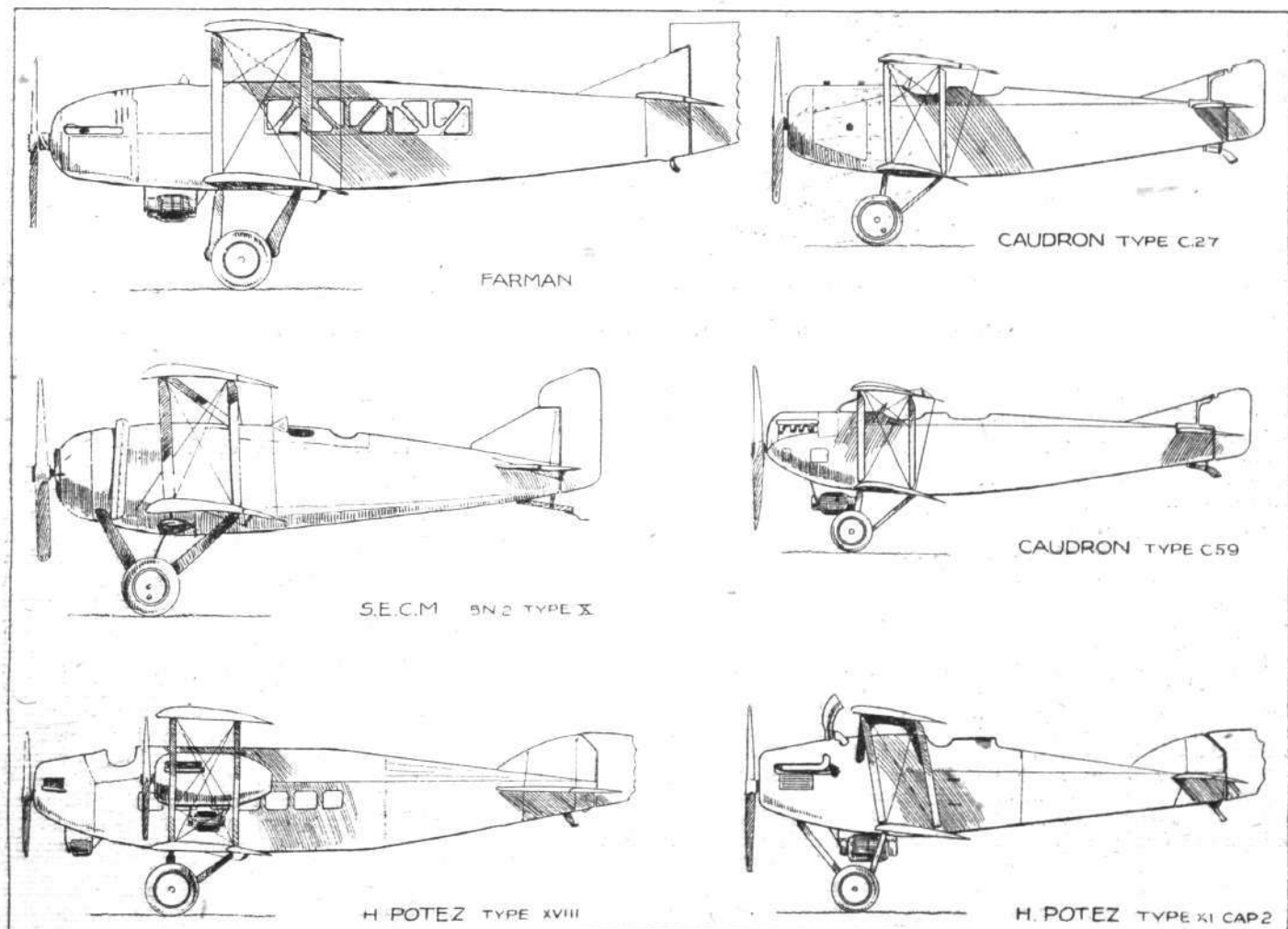


SILHOUETTES FROM THE PARIS SALON : Four seaplanes.

all-metal (Duralumin) work. This is an "Avion de Chasse" with Salmson engine. The wing bracing is unusual in that, although the machine is a biplane, there are no struts. There is a single main spar, although a tube between it and the trailing edge of the Göttingen section helps to a certain extent, and a single lift wire (streamline) runs from the undercarriage to the top plane, passing *via* a large steel clip on the lower main spar *en route*. In a subsequent issue of *FLIGHT* we hope to deal with this machine in some detail.

F. KOOLHOVEN

FRITZ KOOLHOVEN makes his re-entry into aviation with a two-seater fighter monoplane of unusual design. This machine was, we are informed, built in 20 days, and consequently it may be forgiven if the machine looks somewhat rough and lacks some of the high finish found on many French machines. The F.K.31 incorporates a number of unusual features, some of which will be dealt with at greater length in a subsequent issue of *FLIGHT*. In the meantime, it may



SILHOUETTES FROM THE PARIS SALON : Some of the large and medium-sized machines.

be stated that the machine, which is fitted with a 400 h.p. Bristol "Jupiter" engine, is a parasol monoplane, with the pilot seated in a circular cut-out portion of the wing, as in the Bat "Bantam," while a gunner's cockpit is placed just aft of the wing. In order to improve the pilot's view, the centre-section of the wing is kept quite thin, so that he can look over or under the plane. A gun mounting of special design is provided, which enables the gunner to train his machine guns very quickly in any direction.

The undercarriage is of wide track, provided by fitting a small auxiliary wing to the undercarriage struts and housing the wheel axle in this, the wheels forming baffle plates for the ends of the plane. The wing, which is parallel except for the ends, is of Göttingen section, and is braced by two struts. Finally, it may be mentioned that the total weight of the machine is 3,300 lbs., of which the military load forms 1,500 lbs., or 45 per cent. of the total.

LATECOÈRE

SOCIÉTÉ INDUSTRIELLE D'AVIATION LATÉCOÈRE are showing this year the complete Lat. 6, the fuselage of which was exhibited last year. The machine is a huge four-engined *avion de protection*, built entirely of Duralumin, even to the wing covering. The undercarriage of this year's machine has

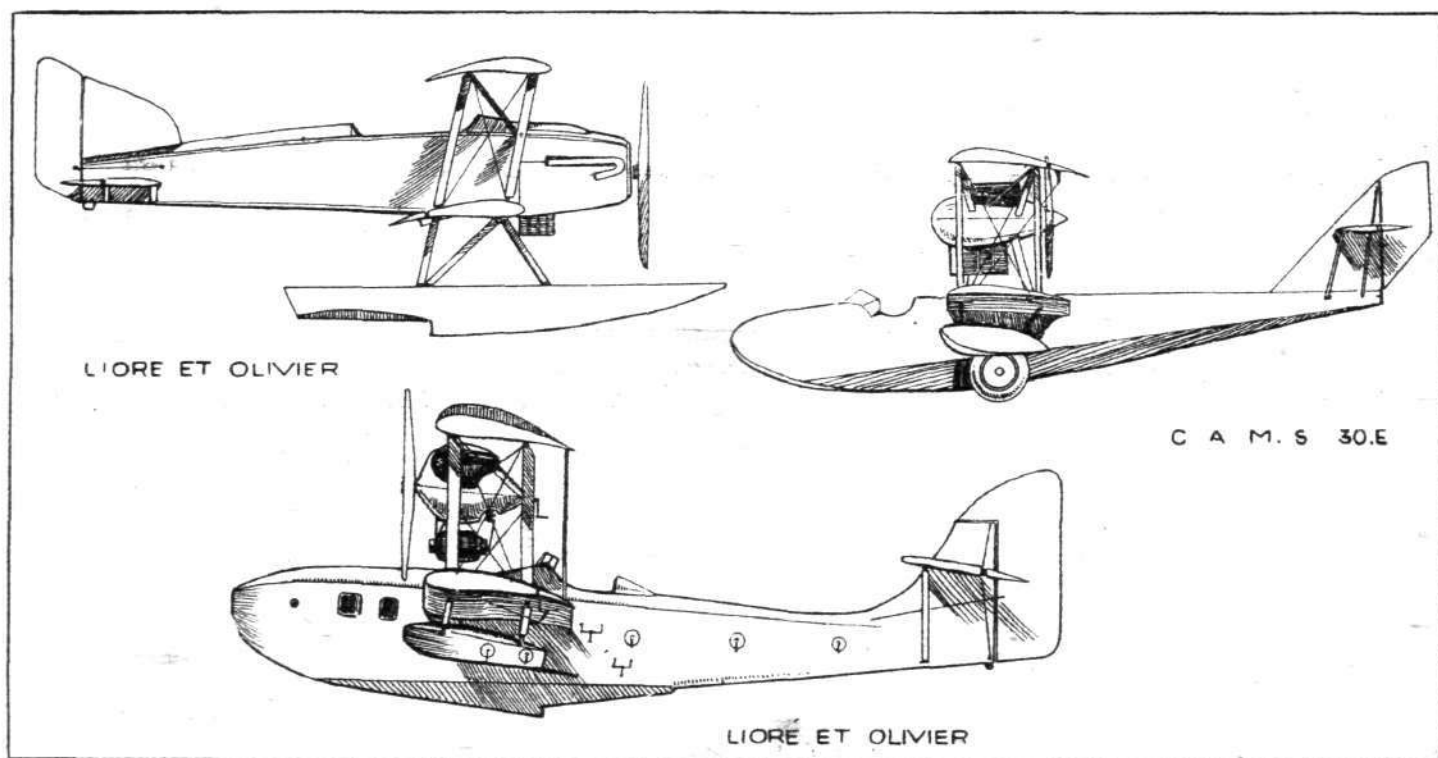
be required to repair the damage. The fuselage is to be covered with plywood so as to form a watertight hull, so that if the machine (which is designed for naval use) has to alight near the aircraft carrier it will float until it can be picked up.

The 370 h.p. Lorraine-Dietrich engine is mounted on a separate structure, built up as a complete unit.

LIORE AND OLIVIER

THE Etablissements L. & O. have been unfortunate this year in the allocation of stands, having been pushed underneath the gallery, where they have had the greatest difficulty in finding space for the two machines shown. One of these is a twin-float seaplane, built entirely of Duralumin, even to the floats. This machine, a biplane, has unusual wing strutting, which causes the wings, when folded, to be tilted at a considerable angle. The wing section used is one of the Joukowski-Göttingen series.

The second machine is a small twin-engined flying boat, with a cabin in the front portion of the hull. The pilot is placed aft of the wings, where he will probably have a rather uncomfortable time of it, what with the indifferent view and the slip stream from the tips of the two propellers. The best feature of this machine is, perhaps, the close spacing of



SILHOUETTES FROM THE PARIS SALON : Three seaplanes.

been redesigned, and now incorporates transverse tubular struts of about 15 ft. length, with a diameter of some 4 ins. We cannot say we particularly like the machine, but conditions in France are so different from those at home that it is difficult to assess the merits of the design. The scheme is certainly ambitious, and time only will show whether the designer is on the right track.

PIERRE LEVASSEUR

Two machines are shown on this stand, one of which is very similar in general appearance to the Blackburn "Dart." This machine is an *avion torpilleur*, type AT. 1, with 600 h.p. Renault engine. Shortly before the Show the machine completed its flying tests, fitted with the older type Renault which develops about 100 h.p. less than the new model. In spite of this, however, the machine is stated to have flown very well, and when the new engine is fitted it is hoped that a considerable increase in performance will be obtained.

The second machine exhibited is shown in skeleton. It is more or less a development of the sporting type exhibited last year, and is remarkable for the fact that its fuselage is built up of four panels of thick ply-wood, forming struts as well as bracing. The sides thus formed are joined together by a few transverse struts on wire bracing. The machine should be extremely cheap to build, although it might be objected that in case of damage to an undercarriage strut (which are parts of the front panels) a whole new panel would

the two engines, which are only just sufficiently far apart to allow the tips of the two propellers to clear one another.

DE MONGE-BUSCAYLET

A VERY interesting monoplane, mainly of Duralumin construction, is shown in a bad corner under the gallery, where it is apt to be passed by without receiving the attention it deserves. M. Louis de Monge has very original ideas on aircraft design, and in this machine he has incorporated a number of unorthodox ideas. The fuselage is of Duralumin construction in front, while the rear portion, with the tail plane and fin, are *monocoque*. The parasol monoplane wing is mounted on centre-section struts formed by rectangular box section arms projecting upwards from, and being built integral with, a fuselage former or bulkhead. This former has somewhat similar downward extensions, which, however, are hinged to the former and act as undercarriage struts.

The monoplane wing is braced by one single large strut on each side, and there are no lift wires. The wings have a pronounced sweep-back in order to allow of placing the pilot behind the rear spar. The arrangement of the rubber shock absorbers is interesting, short radius rods sloping inwards and upwards from the foot of the struts. The engine of the de Monge *avion de chasse* 52C 1 is a 300 h.p. Hispano, and the Lamblin radiator, which is of special design, curves around the lower half of the nose of the fuselage. The machine has an estimated speed of 270 km./hour at ground level.

MORANE-SAULNIER

THE Morane-Saulnier exhibit this year is smaller than usual, consisting of but two machines. One of these is the familiar parasol monoplane, which does not call for any description. The second machine is a cantilever monoplane of rather unusual design, and may be briefly described as consisting of a Fokker wing, an Ansaldo fuselage and a Bat F.K.26 undercarriage.

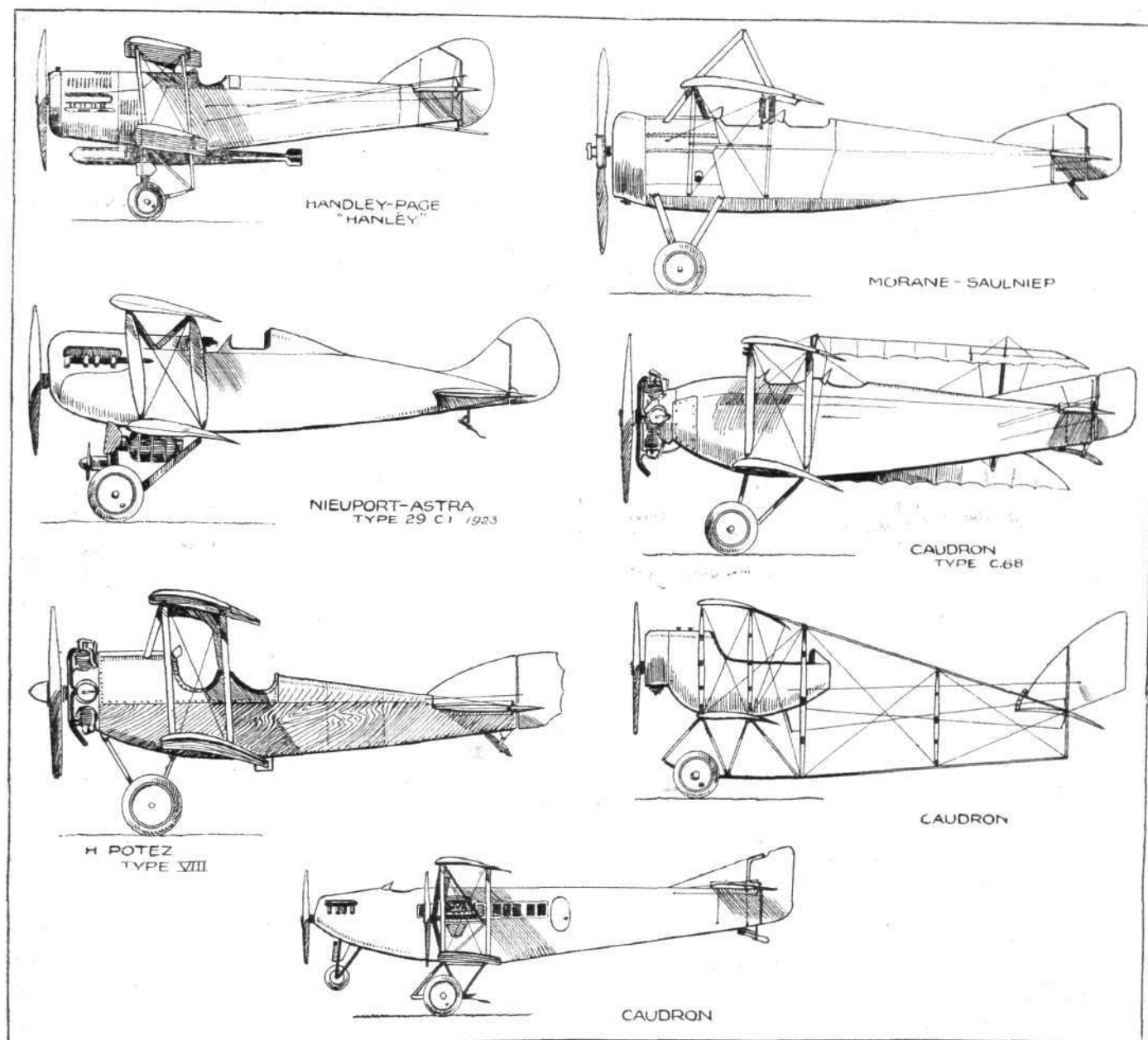
The machine, however, has several interesting features. For instance, the Hispano engine is mounted on a separate engine mounting, which is completely separated from the main fuselage structure. It is attached by four bolts only, and the instrument board, with engine controls, forms part of, and is removed with, the engine unit. It should thus be possible to change an engine in about 10 minutes.

of struts, and is to be fitted, we gather, with a Rateau supercharger and Pierre Levasseur variable-pitch airscrew.

The Nieuport-Delage "Sesquiplan," type 37C 1, has a thick, braced monoplane wing, while a small wing surrounds the axle and part of the wheels. In a general way this machine resembles the one built for the Coupe Deutsch, but which could not be coaxed off the ground. The single Lamblin radiator of this machine is fitted with one of the new shutters, which in appearance resembles a four-bladed fan and is operated by a small differential, thus shutting off the air going through the centre of the radiator.

HENRY POTEZ

Of the three machines exhibited by Henry Potez the three-engined type XVIII is, generally speaking, similar to last



SILHOUETTES FROM THE PARIS SALON: Seven more machines of various types.

The cabin has four seats, of which the front one on the port side is occupied by the pilot. The front of the cabin is formed by large windows, and as the wing is on a considerably higher level than the top of the engine housing, the view is fairly good.

NIEUPORT-ASTRA

THREE machines are shown by Nieuport, two of which are variations of the well-known type 29C 1, while the third is a "Sesquiplan." The nacelle of an Astra-Torres airship is also shown. The smaller of the biplanes has ordinary thin wings, and a single pair of struts on each side. This machine is designed for fighting at low altitudes. The other 29C 1, 1923 model, has a Göttingen wing section, two pairs

year's, among the changes made being the shifting of the pilot's seat from behind the cabin to in front of it. Certain other changes have been made, such as to the undercarriage, etc., but the fundamental idea underlying the design remains unaltered. The machine is designed to carry 12 passengers, and as the power plant consists of three Lorraine engines of 275 h.p. each, the power expenditure per passenger carried is very high. Otherwise the three-engine arrangement has much to recommend it.

The second H. Potez machine shown is a two-seater all-metal reconnaissance biplane, fitted with a 370 h.p. Lorraine engine. It is of orthodox design as regards external appearance, and as all the internal construction is covered up it

is not possible to express an opinion as to its merits. The machine is of the type XI Cap. 2.

Designed as a touring or school machine with 70 h.p. Anzani engine, the Potez type VIII is a straightforward tractor biplane, with the coaming around the cockpits cut down low and only partly separating the two cockpits. This method appears to be becoming popular in France as far as school machines are concerned, probably because it brings pupil and instructor closer together, and enables the latter to shout directions to the pupil.

SAVOIA

A SINGLE flying boat is exhibited on the Savoia stand. Designed by Marchetti, the machine is of typical Italian lines, with flat sides, and the 300 h.p. Fiat engine, placed high in the gap between the planes, driving a "pusher" airscrew. The machine is mainly remarkable for its economy, six passengers being carried in addition to the pilot. This corresponds to a power expenditure of 50 h.p. per passenger, which is distinctly good for a seaplane.

The passengers are seated in two open cockpits, one behind the other, while the pilot is placed in the extreme nose, where his view is certainly excellent but whence he may have some difficulty in "feeling" his machine, owing to the absence of any considerable portion of hull in front of him by which to judge the attitude of the machine.

SCHNEIDER

THE famous Creusot firm, whose activities are intimately associated with France's military organisation, has turned its attention to aircraft construction, and one of the results is the huge four-engined bomber shown in the Grand Palais. The machine is singularly uninteresting, regarded aerodynamically, being very much like the 1917 Gotha except for the fact that it has four engines instead of two. We believe, however, that the all-metal construction (for which, of course, a firm like Schneider et Cie. have exceptional facilities) is very good, and if the designers apply their knowledge of metal work to modern types the firm should produce something really worth while.

WAR INVENTIONS

THE second Report of the Royal Commission on Awards to Inventors is now out, and from the somewhat lengthy list of claims and awards, we notice the following which are connected directly or indirectly with aviation:—

101. Wing-Comdr. F. Ranken ("Ranken" Dart), £2,250.
102. (Baby Incendiary Bomb), £3,500.
103. ("Special Operations" Pistol), Nil.
104. (Relay Tube for Bombs), Nil.
116. Lord Invernairn, Mr. T. C. W. Pullinger, The Galloway Engineering Co., Ltd., and Major F. B. Halford (B.H.P. Engines for Aeroplanes), £20,000.
131. Mr. J. Imber (Self-sealing Petrol Tank), £2,000.
132. Mr. E. C. Lacey (Self-sealing Petrol Tank), Nil.
137. Mr. F. W. Lanchester and The Daimler Co., Ltd. (Improvements in High Speed Reciprocating Engines (Vibration Dampers)), £3,000.
138. Major G. F. B. Turner and Lieut.-Col. C. R. Firsh Noyes ((a) Petrol Bombs; (b) Fuze Pistols for Bombs; (c) Light Cases for High Explosive Bombs), £1,000 jointly.
142. Major F. W. Scarff ((a) Ring Mountings for Machine Guns; (b) Twin Gun Attachments; (c) "Trombone" Attachment for Bomb Sights; (d) Equal Distance Bomb Sights; (e) Improvements in Lewis Gun Magazine), £5,000 in addition to £1,500 already received from the Air Ministry; (f) Gun Cameras, claim abandoned at the hearing.
145. Mr. R. E. Bozon (Aerial Torpedoes), Nil.
146. Mr. A. H. Gledhill (Bomb Release Gears and Control Mechanism), £3,000.
147. Messrs. Vickers, Ltd. (Fabrics for the Gasbags of Aircraft), £1,500.
148. Messrs. Handley Page, Ltd. (Slips forming part of Bomb Releasing Gear), £750.
149. Air Comdr. O. Swann (Twin Float Seaplanes), Nil.

An Adelaide Memorial to Sir Ross Smith

It is proposed by the citizens of Adelaide—his native city—to erect a statue to Sir Ross Smith, to commemorate his flight to Australia. A shilling fund has been established by the *Register*, and £1,500 has been collected, including contributions from many hundreds of school children, some

S.E.C.M.

THREE complete machines are shown by the Société d'Emboutissage et de Constructions Mécaniques, all made of metal. One of these is a night bomber (B.N. 2), type X, with Salmson engine. Long narrow radiators are fitted on the sides of the fuselage, and a circular exhaust collector ring forms the actual nose, somewhat after the fashion of the Bristol "Lucifer." The fuselage is of tubular construction, while the wings have lattice-girder Duralumin spars. The machine is equipped with lights under the wings for landing at night.

The second machine shown is a small touring three-seater with 180 h.p. Hispano engine. The pilot is seated in front, and the two passengers side by side behind the wings.

Shown in skeleton is a school machine, type XXII, with Hispano engine. This machine is also of Duralumin construction with tubular fuselage and wing spars of rectangular Duralumin tubes.

SIMB

THE firm Société Industrielle des Métaux et du Bois, formerly known as the Etablissements Bernard, is showing a most unusual and highly interesting monoplane, built entirely of Duralumin even to the covering of the wings and fuselage. In the design triangulation has been used throughout, and the outer covering, formed of thin sheet strips bent into a channel section, is relied upon to take its share in resisting the stresses. Thus in the wing there are no spars and ribs in the ordinary sense of the words, the structure being composed of built-up and riveted formers arranged to give perfect triangulation.

Aerodynamically the Bernard "Ferrois" is interesting in being a cantilever monoplane with wings placed low à la Junkers and an "inverted T" undercarriage consisting of a single covered-in "leg" growing out of the fuselage and carrying at its lower end a transverse member in which the axle is housed. The machine is of extraordinarily clean outline, and certainly appears to give hopes of justifying its designer's hope of attaining a speed of 315 kms. (195 miles) per hour. With a 300 h.p. Hispano engine the power loading is about 9 lbs./h.p., while the wing loading is about 15 lbs./sq. ft. A thick, high-lift wing section is used.

153. Messrs. Henry Hughes and Sons, Ltd. (Aeroplane Compasses), £2,000.
154. Walton Motors, Ltd. ("Wasp" and "Dragonfly" Aeroplane Engines), £48,000.
155. Mr. W. A. Burns (Anti-Aircraft Sights and High Angle Sights), £2,915.
156. Mr. W. A. Burns (Aircraft Compensation Sights), £500.
157. Comdr. D. T. Graham-Brown, R.N. (High Angle Sights), £1,000.
158. Messrs. Barr and Stroud, Ltd. (Anti-Aircraft Height and Range Finders U.B.2), £3,600.
159. Mr. P. W. Willans (Height and Range Finders U.B.2), £400.
170. Lieut.-Col. Moore-Brabazon (Aircraft Cameras), Ad-journed with liberty to apply to restore.
183. Messrs. Joseph Lucas, Ltd. (Dynamometers for Aeroplanes (Mark 2)), £200.
184. Mr. H. Leitner (Dynamometers for Aeroplanes), £3,500.
196. Messrs. Rolls-Royce, Ltd. ("Hawk" Aeroplane Engine), £2,500.
197. Messrs. Handley Page, Ltd. (1) The "O" Type Twin Engine Aeroplane, and (2) the "V" Type Four Engine Aeroplane), £30,000.
203. Lieut.-Col. H. E. S. Holt ("Holt" Landing Light Brackets and Flares for use on Aircraft), £1,000.
209. Capt. G. T. Smith-Clarke (Calibration of Carburettor Jets), Nil. An award of £15 had already been made by the Air Ministry.
210. The Nieuport and General Aircraft Co., Ltd. ("Night-hawk" Aeroplane), £5,000.
220. Lieut.-Col. Hill and Lieut.-Col. Paul (Fuze Range Sight for A.A. Guns), £1,200.
224. Major D. H. Kennedy (Aircraft Radiators), Nil.

of whom have sent their pennies. In addition to this, the citizens have already subscribed over £2,000, and the organisers are confident that they will receive ample to provide a handsome memorial for the airman's grave, or more probably for the city boulevard. We have not yet heard what definite form it will take.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

COMMITTEE MEETING

A MEETING of the Committee was held on Wednesday, December 13, 1922, when there were present: Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., in the Chair, Wing-Comdr. W. D. Beatty, C.B.E., Mr. Ernest C. Bucknall, Lieut.-Col. M. O. Darby, Col. F. Lindsay Lloyd, C.M.G., C.B.E., Lieut.-Col. A. Ogilvie, Lieut.-Col. M. O'Gorman, C.B., Mr. T. O. M. Sopwith and the Secretary.

Election of Members.—The following new Members were elected:—

Major Frederick Thomas Ashford.
Charles Douglas Barnard.
Walter James Beaumont.
Willoughby Lappin.
Frederic Arthur de Vere Robertson.
Arthur Stradling Willmott.

Sub-Committees.—The Reports from the following Sub-Committees were received and approved:—

Racing Committee, Gliding Committee, House Committee, Finance Committee.

"Daily Mail" Gliding Contest.—The Secretary reported that the expenses of the *Daily Mail* Gliding Contest amounting to £1,275 12s. 9d. had been defrayed by the proprietors of the *Daily Mail*.

Letters were read from the proprietors of the *Daily Mail* expressing their cordial thanks to the Club for carrying out the arrangements for the Gliding Contest, at the same time sending One Hundred Guineas to the Competitions Fund of the Club.

F.A.I. Paris Conference, January 3, 1923.—The following items on the Agenda were considered:—

Tryptique

The Secretary reported that the form of Tryptique approved by the French Customs, and authorised for use in France, had been received, and that the British authorities had been approached to sanction the use of the Tryptique in this country.

The Aero Club de France and the Royal Aero Club would be the responsible bodies in their respective countries for the issue of the Tryptique for aircraft travel. The Tryptique would not apply to air transport companies on the regular routes.

Revised Regulations for Admission of Official Timekeepers.—The revised regulations were considered and approved.

Schneider Race, 1923.—The recommendations of the Royal Aero Club were considered and approved.

Delegates.—The delegates to attend the Conference on behalf of the Royal Aero Club were Lieut.-Col. M. O'Gorman, C.B., Lieut.-Col. M. O. Darby and Lieut.-Com. H. E. Perrin.

Air Conference, 1923.—The following were appointed to represent the Royal Aero Club at the Air Ministry's Air Conference to be held in February, 1923:—

Lieut.-Col. J. T. C. Moore-Brabazon, M.C., M.P., Lieut.-Col. F. K. McClean, A.F.C., Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., Lieut.-Col. M. O'Gorman, C.B., Lieut.-Com. H. E. Perrin.

Aviators' Certificates.—The following aviators' certificates were granted:—

7937 Edmund Arthur Burton, December 5, 1922.
7938 Walter James Beaumont, December 7, 1922.

RACING COMMITTEE

A Meeting of the Racing Committee was held on Monday, November 27, 1922, when there were present:—Maj.-Gen. Sir W. S. Brancker, K.C.B., in the Chair, Commander James Bird, Lieut.-Col. M. O. Darby, Lieut.-Col. F. K. McClean, A.F.C., and Mr. W. O. Manning. In attendance:—Lieut.-Col. M. O'Gorman, C.B., and the Secretary.

Schneider Cup Race, 1923.—The recommendations of the Royal Aero Club for next year's race to be submitted to the F.A.I. Meeting in Paris on January 3, 1923, were drawn up as follows:—

French Air Routes in Rhineland

It is stated that a leading French air company will operate shortly the following air services between France and the Rhineland:—

Mainz-Wiesbaden and Paris; Mainz-Wiesbaden and Cher-

SCHNEIDER RACE, 1923

Recommendations by the Royal Aero Club

Navigability and Watertightness tests shall be one test, and called "Seaworthiness Test," and shall take place on the day preceding the contest, at such time as shall be fixed by the Commissaires Sportifs.

Each aircraft shall cover a course of 5 to 10 nautical miles over the sea, a creek, gulf, estuary or bay, as shall be fixed by the Commissaires Sportifs. After taxiing over the starting line, the aircraft shall rise and continue on the course. During this test, the aircraft shall be taxed over two distances of $\frac{1}{2}$ mile (nautical), the limits of each of these distances being indicated by two buoys, the course between each of these two distances shall be covered in flight.

After taxiing over these two distances, the aircraft shall rise and complete the course, alighting again before the finishing line and taxiing over.

The Commissaires Sportifs may allow any competitor who has not passed this part of the test to make a second and final attempt.

After taxiing over the finishing line, the aircraft shall proceed direct to a mooring allotted beforehand, where it must remain afloat for a period of six hours, with no persons on board. Aircraft leaving their anchorage during this period will be disqualified.

No repairs will be permitted during the Seaworthiness Test.

The aircraft must not undergo any modification between the Seaworthiness Test and the Speed Test. The aircraft will be marked to ensure this.

Speed Test

The Speed Test will be contested over a distance of not less than 200 sea miles. The course may, if necessary, be taken over the coast, the controls being on land, care being taken to avoid all arrangements likely to impede competitors.

The contest will take place between April 1 and November 15, 1923.

Competitors may be started all together or at intervals as shall be fixed by the Commissaires Sportifs. If at intervals, the order of starting will be drawn by lot.

The start may be made from the starting line on the water or over the starting line in flight. The finish over the finishing line must be in flight.

Alightings are allowed.

In the event of damage during the Speed Test, the necessary repairs may be carried out at sea, but these must not alter the original condition in which the aircraft was presented.

GLIDING COMMITTEE

A Meeting of the Gliding Committee was held on Monday, November 27, 1922, when there were present:—Maj.-Gen. Sir W. S. Brancker, K.C.B., in the Chair, Lieut.-Col. M. O. Darby, Major O. T. Gnosselius, Mr. W. O. Manning, Lieut.-Col. F. K. McClean, A.F.C., and Capt. W. H. Sayers. In attendance: Lieut.-Col. M. O'Gorman, C.B., and the Secretary.

Selfridge 50-Mile Gliding Competition.—The Regulations were considered and finally approved.

The following Stewards were appointed to control the competition:—Maj.-Gen. Sir W. S. Brancker, K.C.B., Lieut.-Col. M. O. Darby, Lieut.-Col. F. K. McClean, A.F.C.

DEUTSCH CUP

The Aero Club de France announce that the Deutsch Cup, having been won twice by the Nieuport Co., has been finally awarded to that company in accordance with the rules.

This contest is now closed.

Offices: THE ROYAL AERO CLUB,

3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

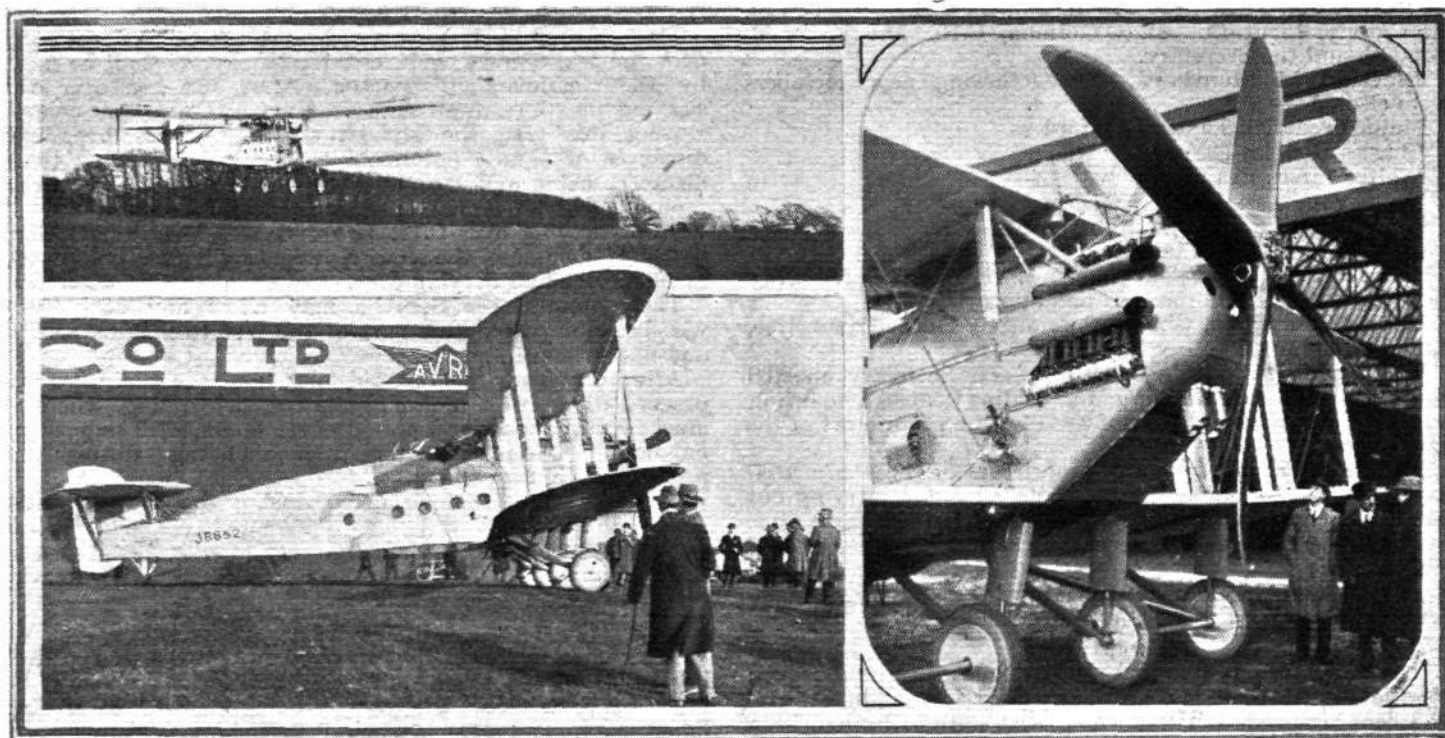
bourg; Mainz-Wiesbaden, Strasbourg and Lyons; Mainz-Wiesbaden and Cologne. The second route should be of service to Transatlantic travellers, whilst the Strasbourg line will connect up the Rhineland by air with Warsaw and Constantinople.

THE NAPIER "CUB" FLIES

AFTER a long and searching series of tests on the bench, the 1,000 h.p. Napier "Cub" carried out, last Friday afternoon, its first official test under actual flying conditions, incidentally marking another eventful day in the history of British—and the world's, for that matter—progress in aviation. This was the first occasion on which an aero engine of such a high power as 1,000 h.p. has ever successfully taken the air—in flight, that is, not for consumption!

Air Vice-Marshal Sir W. G. H. Salmond, K.C.M.G., C.B., D.S.O., Director of Research, and several officials of the Air Ministry were present at Friday's demonstration, and, we understand, that the Director of Research was very impressed by the performance of both engine and machine.

Inasmuch as this Napier-Avro combination is the property of the Air Ministry, we are, unfortunately, unable to give any particulars either of the Napier "Cub" or the Avro.

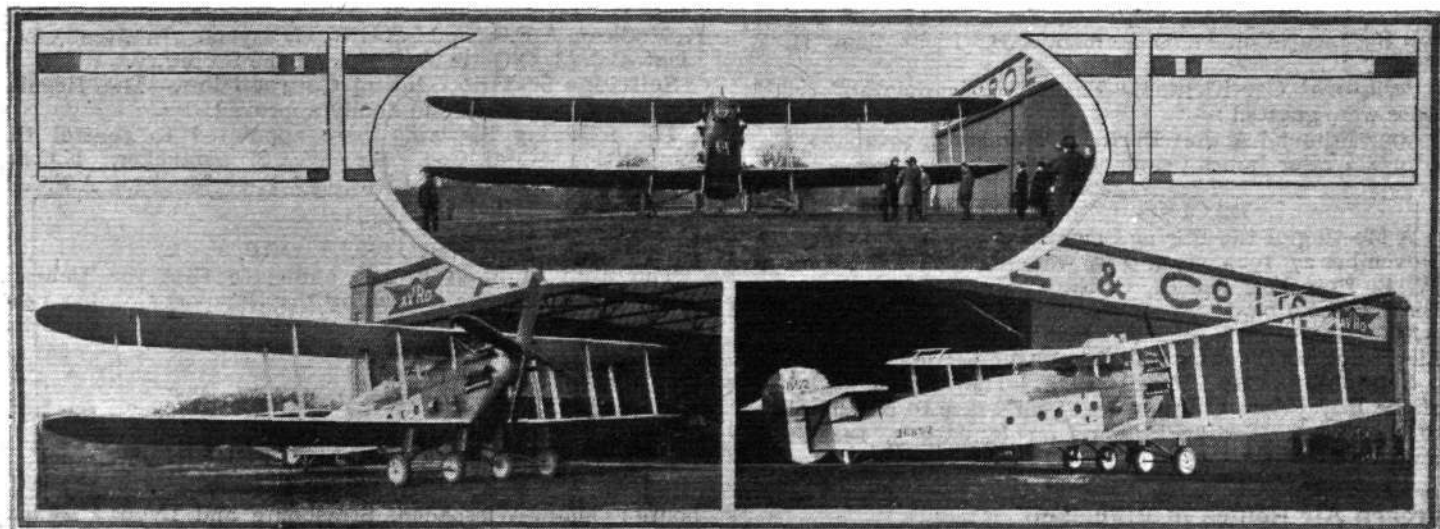


FIRST FLIGHT OF THE 1,000 H.P. NAPIER-AVRO BOMBER: On the left, Bert Hinkler and crew take off at Hamble, December 15, on the Avro Bomber, fitted with a Napier 1,000 h.p. "Cub." Below, just before the flight. On the right, a close-up view of the "Cub" safely installed in its cage.

It is most satisfactory to know that this notable event was achieved by a British firm—or more correctly—firms, for it is not much use designing and building an aero engine of ever-so-many horse-power if you cannot also produce a machine, into which to put it, that will fly. So we must not forget the share of this achievement due to A. V. Roe and Co., Ltd., the builders of the Napier-Avro Bomber which successfully bore aloft the "Cub," roaring, as Shakespeare would have said, "as gently as a sucking dove."

Bomber other than those already generally known to our readers from what has been previously published in *FLIGHT*. For the purpose of placing on record this notable event, however, we give herewith those brief particulars available of engine and machine.

The aeroplane to which this huge Napier is fitted is a specially constructed long-distance Bomber for the British Air Ministry designed and built by Messrs. A. V. Roe and Co., Ltd., of Southampton, one of the oldest aircraft firms,



FIRST FLIGHT OF THE 1,000 H.P. NAPIER-AVRO BOMBER: Three views of the Avro Bomber, with Napier "Cub," a modification of the Avro "Aldershot."



whose machines have achieved a great reputation. It is a further development of the Avro "Aldershot" which made its debut at the last R.A.F. Pageant at Hendon, where it won the Air Force Handicap.

This bomber, the most powerful single-engined aeroplane in the world, is designed to give an exceptional wide range of action. In its fuselage are two decks. On the top one the machine gunner and pilot are accommodated, whilst the lower deck is fitted with bomb sighting and dropping gear.

To carry out all its functions this machine needs a crew of three, and arrangements are ingeniously contrived that they can change places whilst the machine is in flight. Ladders are in position between the decks, making it easy for the crew to change positions as required. The wings of this machine are designed so that they will fold back, thus economising considerably in space for housing purposes.

The whole machine, with the exception of certain parts of the wings, is constructed of metal. It is provided with dual control, with side-by-side seating, and is fitted with self-sealing petrol tanks.

As this machine is designed for long-distance flights, special electrical equipment is installed for keeping the hands and feet of the crew warm, and at the same time preventing the guns from freezing.

The motive power is a single 1,000 h.p. Napier engine, whose performances on its bench tests have been so satisfactory. It is interesting to note the compactness of the machine, and the small appearance of the nose when one considers that a 1,000 h.p. is stored away in a length of only 7 ft. 6 ins. A petrol engine starter is fitted, and does its job well without any fuss.

The "Cub" was designed and built at the Napier factory

at Acton, and although this is the first engine of its type to fly, there are other machines in course of construction for this engine, which will be flown in due course. The principal features in the design of the "Cub" are now well-known. It is built "X" shape of 16 cylinders—4 rows of 4 cylinders—and h.p. for h.p., even better results have been obtained with this engine than with its famous prototype the 450 h.p. "Lion." Although the engine develops over 1,000 h.p., its total weight is only 2,200 lbs.—truly a remarkable achievement. It is particularly economical in oil and petrol consumption considering the power developed.

As regards the performance of the Napier-Avro combination, from our observations of Friday's test both appeared to give entirely satisfactory results. The engine ran with remarkable smoothness and silence. In fact, after the flight, Hinkler said he *could* not realise he had over 1,000 h.p. in front of him. The machine took off after an extremely short run—well under the 200-yd. mark—and climbed very well indeed. Once in the air, Hinkler put it through all kinds of manoeuvres, including some fine banked turns. He told us that it is very nice on the controls and easy to manage. In landing the machine runs but a very short distance after first touching.

As for its pilot, the hero of the London-Turin non-stop flight, etc., we all know Bert Hinkler, so need say nothing further about him other than that the *next* time we go to see him fly the Napier-Avro we will take a magnifying glass to find him when *in situ*. After the flight, Hinkler was presented with a handsome cigarette case by the Napier Co.

Later in the afternoon we witnessed a test flight with an Avro "Bison" fitted with a Napier "Lion," and just as we were leaving the aerodrome we saw Hinkler execute a beautiful loop.

IN PARLIAMENT

German Restrictions on British Aircraft

VISCOUNT CURZON on December 13 asked the Secretary of State for Air whether the German Government has intimated that it will refuse to allow British commercial aircraft above a certain size to fly over the frontier; whether the aerodrome at Cologne will, in consequence of this decision, be closed to air liners carrying on the service between London and Cologne; and whether His Majesty's Government are prepared to tolerate such a situation?

Lieut.-Col. Sir Samuel Hoare: The answer to the first part of the question is that the German Government have made it a condition of according the right of British aircraft to fly to the occupied territory after January 1, 1923, that German machines of equal flying capacity shall be allowed to fly over and land in occupied territory.

As to the second and third parts of the question, His Majesty's Government are fully alive to the urgency of the issues, and are considering them, in consultation with the Allied Governments, with a view to the protection of their interests.

Capt. W. Benn: Does this involve the revision of the Air Clauses of the Treaty of Versailles?

Sir S. Hoare: No, it does not necessarily.

Aircraft Orders

REAR-ADMIRAL SUETER on December 14 asked the Secretary of State for Air whether he is aware that the considerable orders which the late Prime Minister stated, on August 3, 1922, would be placed with aircraft firms in the current calendar year have not yet been placed; and whether he is in a position to state by what date the remaining orders will be given out to the air industry?

Captain Viscount Curzon asked how much of the extra grant for aeroplanes has yet been paid; how much still remains when the orders for the remaining machines have been given out; whether he is aware that Messrs. Napier and many other firms concerned with the manufacture of aircraft and engines will soon have to close down altogether unless more orders can be given out; and whether he is in a position to make any statement about the matter?

Sir S. Hoare: Under the authority given by the late Government, as announced in this House on August 3, orders for aircraft and engines to the value of about £280,000 were placed with a number of private firms during the autumn. As deliveries will not be completed by March 31 next, only a part of this liability will fall due this financial year. Since the present Government assumed office, no further orders have hitherto been given, as the expansion of the Air Force was one of the commitments of their predecessors which they felt bound to examine. The preliminary examination which has already taken place enables me to inform the House that the formation of the additional regular squadrons for home defence will now proceed. As I am aware of the serious position in which certain firms are placed, I am glad to be able to assure my hon. friend that definite orders for additional aircraft and engines will be immediately placed. Pending a fuller review of the situation, however, no further progress will be made with the scheme for an Auxiliary Air Force. I would add that, apart from this, I am making a further close scrutiny of the estimates.

Viscount Curzon: Will the right hon. gentleman carry out the examination, if he has not already done so, of the condition of many firms in the industry, and see to it that they are not allowed to go under, such as the firm mentioned in the question?

Sir S. Hoare: I have already done so, and I can assure my noble friend that I am fully aware of the difficulties in which they are placed, and I have dealt with that point in my answer.

Aerial Survey of Irawaddy Delta

PROPOSALS have been made for the aerial survey of the Irawaddy Delta, in Burma, and this will probably be undertaken in April next. The estimated cost is 330 rupees (£22

per square mile for 777 square miles; if a survey of the whole delta is made, involving an additional 1,000 square miles, the extra cost will be only 84 rupees (£5 12s.) per square mile.

Captain W. Benn: Do the Government adhere to the policy of their predecessors, to find any money which may be required for the Air Force by economies on the other two Services?

Sir S. Hoare: Certainly, so far as possible.

Thames Air Station

SIR HARRY BRITAIN asked the Secretary of State for Air which is the length of notice which must be given to enable machines to alight on the Thames at Westminster; and whether it is the intention of the Ministry to give any further facilities to seaplanes making use of that permission?

Sir S. Hoare: The answer to the first part of the question is that applications to alight on the Thames at Westminster, if approved by the Air Council, would then require consideration and approval by the Port of London Authority. The length of time required to obtain the necessary permission would, I understand, depend upon the circumstances of each individual case. With regard to the second part of the question, no requests have up to the present been received to make use of the Thames at Westminster for a regular air service, and the establishment of a permanent air port in this part of the river is not, therefore, immediately contemplated. In these circumstances I do not think that expenditure upon the provision of any special facilities could be justified at the present stage.

Civil Aviation Records

SIR J. NORTON-GRIFFITHS asked what is the total distance accomplished by any British aeroplane engaged on one or other of the passenger air routes, and on what air line the record was made; and the line on which the next best record was achieved?

Sir S. Hoare: The greatest total distance flown by any British aeroplane engaged on the passenger air routes is 100,393 miles by a "D.H.34" aeroplane, operated by the Daimler Hire Co. The next best record is held by an aeroplane belonging to the Air Ministry, type "D.H.18," which has been used by various firms, but chiefly by the Instone Air Line. This aeroplane has flown approximately 70,000 miles. While these performances, of course, reflect credit both on the constructing and operating firms, I should add that the data are as yet insufficient for a definite conclusion as to the respective merits, either of types of aeroplane or of methods of operation.

R.A.F. Harlescott Depot

VISCOUNT SANDON asked whether he can give any further information as to the sites alleged to be vacant in the possession of the Royal Air Force depot at Harlescott, Salop?

Sir S. Hoare: The accommodation at present vacant consists of about 12 barrack blocks situated at the south-west portion of the camp, adjacent to the railway line. These are required to meet any further increase in the strength of the Royal Air Force at Harlescott. There is also unoccupied at present a portion of the women's hostel, which is needed for conversion into airmen's married quarters as soon as funds can be made available.

Aircraft Insurance Scheme

LIEUT.-COMMANDER KENWORTHY asked the Chancellor of the Exchequer what is the total amount that was paid in premiums during the War for insurance against damage by enemy aircraft under the Government scheme; how much of this has been paid out in claims; and what is being done with the balance, if any?

Viscount Wolmer: The net premiums received by the Government under the Aircraft Insurance Scheme amounted to £14,086,615, and the amount paid in claims was £3,046,790. The balance of the fund was paid into the Exchequer at the time.

THE NEW FOKKER AMPHIBIAN FLYING BOAT

450 H.P. Napier "Lion" Engine



THE FOKKER AMPHIBIAN : Front view. Note how machine floats on an even keel.

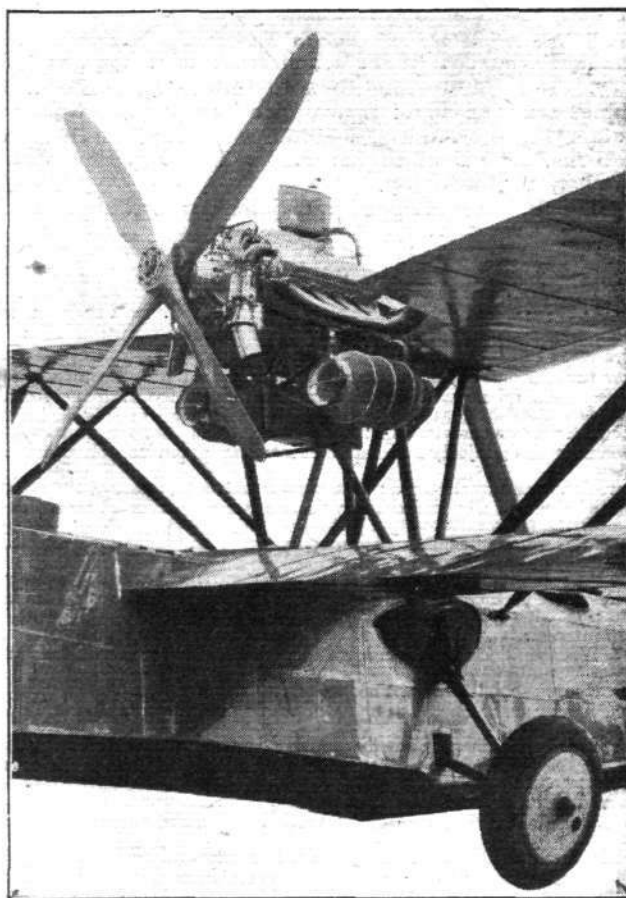
In September of this year the N.V. Nederlandsche Vliegtuigen-fabriek (Fokker) of Amsterdam launched a new machine of somewhat unusual design. This machine, an amphibian flying boat with Napier "Lion" engine, has recently been tested over the IJ, and is said to have given a very good performance. It appears probable that, had the French authorities responsible for the Paris Aero Show not decided to debar the N.V. Nederlandsche Vliegtuigenfabriek from exhibiting this year, the Fokker Amphibian might now have been at the Grand Palais. It may not, therefore, be out of place if we publish in this issue a brief description and some photographs of the machine.

In general arrangement the Fokker Amphibian is a biplane "pusher" flying boat, with a Vee-bottom hull built entirely of Duralumin. To a certain extent it may be said that the hull form resembles that of a Vickers "Viking," but the construction is, of course, entirely different, and the rest of the machine is totally dissimilar. Thus the engine, instead of being mounted between the planes as is usual practice in British flying-boat design, is mounted in the top plane.

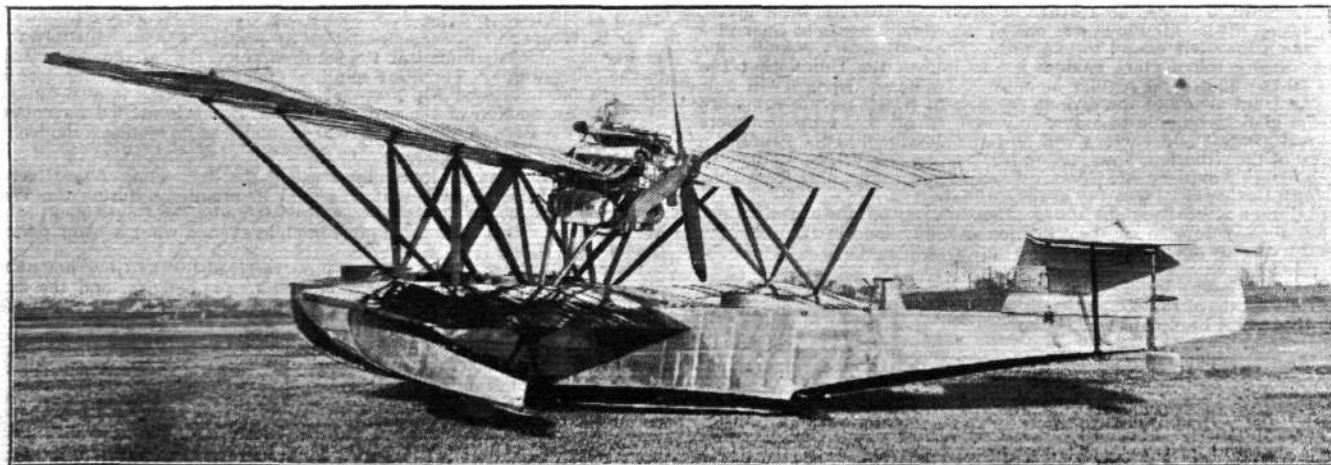
By choosing a lower plane of small chord it has been possible to keep the overall height down to a minimum, and as the hull is of fairly large beam the machine possesses a considerable degree of stability on the water. Thus it will be noticed that in one of our photographs, showing the machine at rest on the sea, there is no list, and neither wing-tip float touches the sea.

The boat hull, as already mentioned, is built entirely of Duralumin, having a girder of this metal running along inside and forming a keelson. The hull is covered with sheet Duralumin, and is divided into 11 watertight compartments, formed partly by the keelson and partly by transverse bulkheads. As in the Vickers "Viking," there are two steps, of which the front one occurs approximately under the centre of gravity, while the rear step is nearly half-way between main step and stern post. The steps are of the open type so as to allow the water to run out easily on taking off.

Although the Fokker Amphibian can be supplied either as a commercial machine or for military purposes, the accompanying photographs show the latter form. There are four seats, arranged as follows:—In the nose is a cockpit for the front gunner; between this and the wings is a second cockpit,



THE FOKKER AMPHIBIAN : View showing amphibian gear and mounting of Napier "Lion" engine.



THE FOKKER AMPHIBIAN : Three-quarter rear view of machine on land.

in which pilot and engineer are seated side by side, the pilot on the starboard side. Some distance behind the wings is a third cockpit for the rear gunner. The forward cockpit has a set of controls, so that, if necessary, the machine can be piloted from here. When not in use the front controls, and incidentally the gunner's seat, can be folded out of the way.

Communication between the three cockpits is by a tunnel on the starboard side, and the amphibian gear is reached through this from the pilot's cockpit. The wheel axles are hinged on the sides of the hull, and sloping compression struts (telescopic) run from the axle into the top of the hull (through watertight bags), where is situated the gear which raises and lowers the wheels. The handle for operating the landing gear is situated in the pilot's cockpit, and can be reached by either the pilot or the engineer, or even by the front gunner.

The four main petrol tanks, having a total capacity of 600 litres (132 galls.), are placed between the landing gear and the aft gunner's cockpit. A small service tank is mounted in the top plane.

A structure of streamline steel tubes resting on the hull carries in front the two halves of the top plane, while further aft it supports the engine bearers. This structure is so arranged that it is possible to change the engine without interfering in the slightest with the wing structure.

The top plane is characterised by a pronounced dihedral, and is also swept back, while the lower plane has a slight dihedral only. The bracing is in the form of an irregular

Warren girder, the sloping members of which are plain double struts, while the vertical (or nearly so) struts are of N formation. Both wings are of wood construction and covered with three-ply. The wing-tip floats are, like the main hull, built of Duralumin.

The Napier "Lion" engine is, as already mentioned, mounted in a cut-out in the top plane, in such a position that it can be easily got at and lifted out by a crane. With its two Lamblin radiators and oil tank it forms a complete unit, and is attached to the tubular structure by four bolts only. A four-bladed "pusher" airscrew is fitted, which consists in reality of two two-bladed screws having thin bosses so as to allow them to be mounted one behind the other on the air-screw shaft.

The tail is of usual type, with a very thick fin, to which is hinged the balanced rudder. The tail plane is of the trimming type, the worm gear being housed inside the fin. Both tail plane and rudder are well clear of the water, and for steering on the sea the tail skid, which is mounted by the rear step, is so shaped as to form a water rudder.

Following are the main characteristics of the Fokker Amphibian: Length o.a., 12 metres (39 ft. 4 ins.); span, top plane, 18.2 m. (59 ft. 8 ins.); span, bottom plane, 10.5 m. (34 ft. 5 ins.); chord, upper, 2.4 m. (7 ft. 10 ins.), lower, 1.8 m. (6 ft.); height, 3.3 m. (10 ft. 10 ins.); weight empty, 1,800 kg. (3,960 lbs.); useful load, 800 kg. (1,760 lbs.); endurance, 4 hours; maximum speed, 125 m.p.h. The machine gets off with full load in 20 seconds.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN DECEMBER 3 AND DECEMBER 16, INCLUSIVE

Route (including certain diverted journeys)	No. of flights*	No. of passengers	No. of flights carrying		No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
			Mails	Goods				
Croydon-Paris ...	23‡	41	6	21	22	h. m. 2 36	H.P.W.8BG-EBBH (2h. 3m.)	G. (9), H.P.W.8B (3).
Paris-Croydon ...	24§	58	5	18	18	3 26	H.P.W8B G-EBBG (2h.40m.)	G. (10), H.P.W.8B. (3).
Croydon-Brussels-Cologne	8	25	6	—	6	3 35	D.H. 18 G-EAWW (2h. 58m.)	D.H. 9 (1), D.H. 18 (1), D.H. 34 (3).
Cologne-Brussels-Croydon	8	17	5	—	4	5 11	D.H. 34 G-EBBR (4h. 48m.)	D.H. 9 (1), D.H. 18 (1), D.H. 34 (3).
Croydon-Rotterdam ...	10	13	10	10	10	2 41	Fokker H-NABM (2h. 9m.)	F. (6).
Rotterdam-Croydon ...	9	13	9	9	5	3 21	Fokker H-NABI (2h. 22m.)	F. (7).
Manchester-Croydon-Amsterdam	12	45	—	—	12	4 56	D.H 34 G-EBBQ (4h. 52m.)	D.H. 34 (3).
Amsterdam-Croydon-Manchester	16¶	31	7	3	15	—	—	D.H. 34 (3).
Total for two weeks ...	110	243	48	61	92			

* Not including "private" flights.

† Including certain journeys when stops were made *en route*.

‡ Lympne-Le B., 9. § Le B.-Lympne, 5.

|| Man.-Croy. 6, Croy.-A'dam. 3.

¶ A'dam.-Croy. 7, Croy.-Man. 9.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. Sp. = Spad.
Vi. = Vickers Vimy. Vu. = Vickers Vulcan. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc.:—Co. des Grander Expresses Aériennes; Daimler Hire, Ltd.; Handley Page Transport, Ltd.; Instone Air Line; Koninklijke Luchtvaart Maatschappij; Messageries Aériennes.

Incidental Flying.—Mr. Perry and Capt. Stocken testing Avro and D.H. 9 machines at Croydon for Aircraft Disposal Co.

London-Berlin Air Route

PROGRESS is apparently being made in respect to the Anglo-German air line between London and Berlin, and it is expected that this service will shortly be in operation, both with British and German machines. An Albatross six-seater monoplane, carrying three directors of the Deutsche Luft-reederei Co., left Berlin for London on December 14, but had to descend near Bremen owing to fog.

Nieuports for Spanish Army

AFTER keen competition between the Dutch Fokker and the French Nieuport firms for an important tender for 30 aircraft for the Spanish Army, the Nieuport firm have succeeded in scoring the greatest number of points during the performance trials, and have thus obtained the contract. The two types of machines involved were both biplane chasers, fitted with 300 h.p. Hispano-Suiza engines, and it is

interesting to note that their performances were nearly identical. It is to be regretted that no British firm competed for this tender, and it is to be hoped this will not be the case when the next tenders are put out next February.

A Successful Flight by "S.C.W." Glider

ON Sunday last Maj. Maurice Wright accomplished a successful flight on the "S.C.W." (Sayers-Courtney-Wright) Glider at Itford, where they—the Gliding Partners—have been carrying out further trials with their 'bus since the Gliding Competition. With little or no wind to help it, the glider started off on Sunday with a splendid zoom, followed by a brief period of hovering. The pilot then started off on a beautiful, flat, glide of about 1½ miles, at the end of which he made a perfect landing. It would seem, therefore, that the "S.C.W." glider is at last satisfactorily adjusted, and we congratulate the partners on having achieved success.

"AVIATION IN INDUSTRY AND WAR"

FOLLOWING a dinner at the Trocadero Restaurant on November 28, a discussion under the above title was opened by Col. Sir Alan H. Burgoyne. The occasion was a Club dinner of the Imperial Industries Club, at which Sir George Wyatt Truscott presided as Vice-President, in the absence of the President, Sir George H. Chubb.

The Chairman, in inviting Sir Alan Burgoyne to speak, reminded those present that Sir Alan 26 years ago made his début in the Club in a prophetic discussion on "Submarines in the Next War," which had proved his great foresight. It was therefore very appropriate that he should now open the discussion upon the selected subject for that evening.

Sir Alan then referred to the tremendous strides made in aviation during the War. Less than a week ago he was going through a statement of the inventions which had had the greatest influence on progress during the last decade, and he was astounded to find that aviation and the internal combustion engine were not mentioned. One astounding factor stood out in military history, namely, that the great soldier of today thinking of the war of tomorrow would envisage it as upon the lines of the war of yesterday; he would never grasp the war of yesterday was a thing finished and gone for ever. We started the War, he continued, with, roughly, 80 aeroplanes, 167 officers and 1,600 non-commissioned officers and men; we ended the War with 22,000 planes in existence. Between January and October, 1918, we built 26,000 aeroplanes and 29,000 engines. The French had 20,000 planes, and the Germans nearly as many. We destroyed just on 8,000 aeroplanes between July, 1916, and the Armistice.

He condemned the controversy as to aircraft and ships, but was opposed to spending millions on two ships. There were two ways only in which the British Fleet could be beaten; one was by a superior fleet, and the other by an arm that could ignore the existence of the Fleet. The power of the British Fleet in the War had been muzzled owing to submarines and aeroplanes; and it could not go out unless the German fleet came out too. The development of aviation was continuing. During the late War the biggest bomb dropped in this country weighed 600 lbs., but in two countries today experiments were being carried out with bombs of 2,000 lbs. weight. The air fleet in existence in France today could very easily, on the first day of the outbreak of war, drop 200 tons of explosives on London, and afterwards continue with 70 tons a day without adding a single aeroplane. One could conceive that the Navy of the future would consist of fast aeroplane carriers, still faster light cruisers and infinitely faster destroyers, and a battle would begin by an attempt on both sides to smash one another's plane-carriers. Speaking of civil aviation, Sir Alan Burgoyne referred to the sad spectacle of a science brought to such a development during the War being allowed to sink almost into desuetude. If only our Government had taken that keen initiative that poor, poverty-stricken France had taken, we should be in a far better position than we were at the present time.

Lieut.-Col. J. T. C. Moore-Brabazon, M.P., said that aviation was really a nightmare to think of because of its development in the late War. He had hoped it would be a link between peoples. Things had been very bad with aviation for some time, but he expressed the hope that the ebb tide in civil aviation was now over, and that we were started on the flood. In visualising the next war, he would say that the country which got the supremacy of the air could not lose the war. He granted that they wanted other forces to compel a successful victory. The first thing necessary would be to attempt to destroy the enemy's aeroplane works, because by doing that one would stop the enemy's power to reply, and one's own supremacy became greater and greater. Consequently, it was necessary for aeroplane manufacturers to get all the protection they could, and, if possible, get underground. He had just gone through an

election, and while he had been bombarded with questions on drink, education, divorce, etc., he had to withstand no pressure on the question of air power.

Sir Sefton Brancker referred to the importance of maintaining the interest of the public in aviation. The Press, he said, had been wonderful in its support, but the public were still lagging behind. Air transport was now in a precarious condition, because it was, as yet, a proposition that did not pay. It could not be expected that a new industry would pay at once, and it was necessary that air transport should be assisted in some way. The public had not yet been educated up to the knowledge that air transport was the way to travel, and until that was done it was up to the Government to see that the industry got through. He thought the friction between the Army, the Navy and the Air Force was a passing phase, and urged the formation of an Imperial Defence Committee. At present the Services were hampered by the shortage of money. He commended the work of the International Aviation Board as likely to have a good effect, owing to the camaraderie of the air. At present civil aviation was a mere child feeding out of the bottle. Air transport could not affect an air force except in building up a valuable reserve. Civil aviation had four essentials—safety, reliability, comfort and economy, and the first three were not consistent with the fourth. Five years hence, he thought, civil aviation would be paying its way. Engines were becoming more efficient, and did not require overhauling so often. Wooden construction was being replaced by metal construction, and costly petrol would be replaced by heavy oil. Greater reliability meant less insurance. There was no doubt in his mind that just as this nation was the leading nation of sailors, so would it also be the leading nation in the air. British pilots were unequalled, and the same applied to the mechanics. He urged the linking up of the Empire by aeroplane, and hoped at some time or other to see the journey between this country and New York covered in eight hours.

Mr. Handley Page compared the Government assistance being given to air transport in France with that of this country—£15,000 against £150,000—and pointed out that despite this disparity our machines on the London-Paris route carried 75 per cent. of the passengers who travelled by air. He thought we ought continually to extend the service until it linked up this country with India, and said he believed that was certain to come in time. In his opinion the results achieved by British machines were well worthy of further support for linking up the different parts of the Empire, which was something even more important than aviation.

Mr. A. H. Ashbolt, Agent-General for Tasmania, said that he had been interested in airships for many years, and in 1911 endeavoured to get the War Office to look into the working of an aeroplane by wireless; but in spite of all his endeavours it never got beyond the War Office office door. The Imperial aviation problem should be supported by, if necessary, sacrificing one or even two cruisers. The Government had the power to force first-class mail into the air, and that would overcome all difficulties of subsidies, etc. Important experiments were maturing with heavy oil for engines, and if successful it would be an immense step forward in the safety factor for airships.

Mrs. Yorke Fausset, Capt. Kingston-McCloughry and Mr. Griffith Brewer also contributed to the discussion, and a very enjoyable evening was concluded with a hearty vote of thanks to the Chairman.

Amongst others present were Col. the Rt. Hon. the Earl of Denbigh and Desmond, C.V.O., A.D.C., T.D., Col. Sir J. Roper Parkington, D.L., J.P., Prof. Hugh H. L. Bellot, M.A., D.C.L., Lieut.-Col. the Hon. P. Pelletier (Agent-General for Quebec), Capt. Victor Gordon (Acting High Commissioner for Newfoundland), Sir Basil Mayhew, K.B.E., F.C.A., F.S.S., Major the Hon. H. Fletcher Moulton, M.C., Mr. J. E. Evans-Jackson, Mr. Harold M. Barton, Mr. J. H. Evans-Jackson (Hon. Secretary), etc., etc.



Syrian Air Routes

THE Syrie-Liban Aero Club, recently formed with the object of developing aviation in Syria, is to be affiliated to the Aero Club of France, and a certain liveliness in aviation matters may be expected in this country in the near future. The French Air service have already organised 50 landing stages, 10 of them fully equipped as regards shelters, re-

victualling and repairing arrangements. The principal lines thus prepared are Alexandretta, Aleppo and Deir-az-Zor, on the route to Baghdad; Aleppo, Hama, Homs, Rayak and Damascus, towards Palestine and Egypt; Damascus, Palmyra and Deir-az-Zor, for the direct crossing of the Syrian desert in four hours; Alexandretta, Latakia and Tripoli for the coastal line.



LONDON TERMINAL AERODROME

Monday Evening, December 18

THE most significant event on the European airways this week is the start of the flight by a German commercial aeroplane from Berlin to London. This machine is an Albatros, with accommodation for eight passengers, and is driven by a Rolls-Royce "Eagle 8" motor. The pilot on this flight is Herr Ungerwitt, and it is understood that there are three passengers, all directors of the Deutsche Luftreederei, who are flying to Holland and London to consult with the Royal Dutch Air Service and the Daimler Airway as to the final details for the opening of the London-Berlin service.

Owing to thick fog, which hung over Holland during Friday and Saturday, the machine was compelled to descend at Bremen, and, up to date, no further news has been received.

The Winter Passenger Traffic

IN spite of the fact that fog has interfered to a great extent with the regular operation of the various services, over 100 passengers have been carried during the week. Saturday was the only absolutely blank day, and the irony of the situation was that, although Croydon was perfectly clear—and, in fact, ideal for flying—there was fog at all the other terminals; Manchester, Brussels, Paris and Rotterdam all being hidden in dense fog. Even the K.L.M., who are not, as a rule, deterred by inclement conditions, had to call flying off on this occasion.

Handley Page Transport continue to carry the highest average loads, but, having regard to the bookings already being made on the Manchester and Amsterdam routes, it would appear that this distinction will be closely challenged by the Daimler Airway in the coming summer. The Instone Air Line are having some difficulty in getting passengers, although, considering the time of the year, air travellers are really as numerous as can be expected.

The Instone Air Line are anxiously awaiting some result of the conference which is now going on between the Air Ministry and the German Government as to the question of British machines of the size of the "34's" and "18's" flying into German territory. As matters stand at present, I am informed that the Instone Line only has permission to fly until the end of this year, and, unless some arrangement is made in the meantime, the service will be compelled to cease operations then—at any rate until such time as further

arrangements are made. Incidentally, the Instone Air Line are receiving enquiries for many special flights which are next to impossible of accomplishment. One, for instance, was for a special aeroplane for a flight to Durban in South Africa and back, and the enquirer wished to know if they had made this flight often, and were familiar with the route! Another was for a special from Paris to Palestine, and was a much more likely proposition. I hear also that a would-be air passenger who had read the Instone advertisement on the side of Basil Foster's office, which makes some reference to New York, enquired at the office for a flight to that city. Another amusing application which has been received—this time by Handley Page Transport—was from a lady, who, being very sensitive to height, and yet at the same time desiring very much to fly to Paris, thought she might get over the difficulty by flying at night—in this way, owing to the darkness, being unable to see "how far she had to fall."

The Surrey Flying Services have been fairly quiet of late, but appear to be busy always in their various workshops. On Sunday, the fine weather brought a few joy-riders down to the aerodrome, and the Surrey Flying Services' Avro was in the air on several occasions.

Season Tickets on the "Airway"

AIR season tickets are being issued by the Daimler Airway for the flight between Manchester and London. These cost £100, and are available for 50 single or 25 return flights, and show a saving on a return flight of 10s. Several have already been taken out by business houses in Manchester.

Incidentally, I was given an explanation by a business man of why he and his Manchester colleagues use the air service from Manchester to London. It appears that, although the actual time saved by the air journey is only about an hour-and-a-half, it makes all the difference between arriving in London before or after lunch, and, as the British business man has a liking for discussing business over lunch, quite a number have adopted the flying habit.

The amalgamation between the C.M.A. Air Lines and the Grands Express is still hanging fire, and no definite details have, as yet, been settled. It is their intention to open a service from Paris to Cologne in the new year, but they are in the same position as Instone's with regard to permission from Germany to run a service there.

EXPERIMENTAL DATA WITHOUT A WIND CHANNEL*

By O. T. GNOSSPELIUS

IN his opening remarks the author stated how, in the year 1920, it became evident to him that it was very necessary, if improvements in existing aeroplanes were to be made, to increase our knowledge of the aerodynamic forces by means of which we fly, and in order to do this it became necessary to measure these forces oneself.

"In discussing this question," he said, "with Mr. Jones, the very able chief draughtsman of Messrs. Short Brothers, Ltd., he brought to my notice an article in *Aeronautics* of November, 1911, where the writer, Mr. Ellis Williams, B.Sc., describes a method of measuring these forces by means of swinging models of the desired shape on the end of a pendulum. This seemed a hopeful method, and, at any rate, well within the means at my disposal, which consisted in labour and material which I could acquire in the works.

"The first rough experimental pendulum was constructed of a piece of wood about 2 ins. by 1½ ins. cross section and about 11 ft. long, suitably pivoted. With this we found it was possible to measure lift and drag forces, but the speeds attained were very low; it was necessary to increase the speed. We then constructed a pendulum about 20 ft. long to swing in the large shop; this gave higher speeds, the pendulum being dropped from the horizontal plane, but we found that air currents and flexibility made the movements too erratic to be of any use for measurements.

"We then decided that we must work in a lower, more sheltered shop with a shorter pendulum, and increase the speed by other methods. It was evident that the method of dropping from the horizontal was practical, and it appeared that by raising the centre of gravity of the pendulum to the highest possible point the time of swing would be decreased and the velocity at the bottom of swing increased.

"It must be understood that the method adopted in nearly all these experiments was to hold the model so that the plane of flight was in the plane of the pendulum, lift being measured

by the horizontal deflection of the pendulum at the lowest point of swing, and drag by the length of swing of the pendulum.

"The section of the pendulum arm must be cylindrical in order to avoid effects on lift readings due to the pendulum not travelling in a plane path. The pendulum arm was therefore constructed of tube.

"For high speeds it is necessary to keep the centre of gravity of the pendulum high; the lower part of the pendulum must therefore be light, and we constructed it of Duralumin tube of 1½ ins. diameter, extending for about two-thirds of the length of the pendulum. The top third was a steel tube of 1½ ins. diameter telescoping over the Duralumin tube. The pivot originally was constructed with two bearings at right angles, one allowing for the normal swing of the pendulum, and the other allowing for lateral deflection for lift readings. We found, however, that, with this second pivot, the deflections for lift were much too great for practical purposes; we therefore fixed this pivot, the lateral deflections of the tube under the lift forces being quite sufficient for measurement. These deflections are of the order of 3 ins. for maximum lift on normal 18-in. by 3-in. sections. The force causing the deflection can be found with great ease by direct calibration of deflections against known loads. To obtain high speeds we loaded the pendulum by casting a lead weight of about 35 lbs. round the top tube as near the pivot as possible. With this combination and a normal-weight model we were able to obtain a speed of from 45 to 50 ft./sec. at the bottom of the swing, depending on the weight of the model.

"The drag forces are measured by the height of swing of the pendulum at the end of the first swing. Attempts were first made to observe this value by recording a trace of the end of the swing by a marking mechanism on the pendulum, but it was found that, as this measurement was required with great accuracy and the drag forces are very small, the varying frictional forces of the marking mechanism were sufficient to

* Paper read before the Institution of Aeronautical Engineers, at the Engineers' Club, on December 15.

affect seriously the drag measurements. This method was therefore abandoned in favour of a hit-or-miss method, where a pin inserted in a scale was either knocked out or left untouched by the pendulum. With several swings of the pendulum we found that the top of the swing could be located to at least $\frac{1}{16}$ in., which gave very fair accuracy in these measurements.

"Lift forces are converted into absolute coefficients by calculating the maximum speed of the pendulum. Drag forces are calculated from an integration of the speed of the pendulum throughout the swing.

"*Initial Drag.*—It is obvious that the length of swing of the pendulum is a measure of the combined drag of the model and pendulum. It is now necessary to subtract the resistance of the pendulum. To do this in principle it is only necessary to detach the model and replace it by a mass equal to that of the model, with its centre of gravity on the same radius of swing as that of the model. This mass must offer no air resistance. The height of swing of the pendulum must then be observed.

"This problem developed the method of holding the model in a frame. The frame is tubular, and the mass takes the form of lead weights inserted in the arms of the frame. After a time all models were tested in this way on account of observations when pressure plotting, which indicated that air-flow at the ends was affected by end support.

"The angle of the model is measured from a protractor fitted on a stand under the vertical position of the pendulum.

"A light arm carrying a recording pencil is mounted crossways on the bottom of the pendulum. This records lift on a piece of paper held on a suitable frame to the side of the path of the pendulum.

"*Advantages of Method.*—The air through which the model passes is still, and there can be no question of turbulence or steady flow. Wall effect, which may be great in an ordinary wind tunnel, is greatly reduced. The cost of running the apparatus is very small. The apparatus is cheap, and the power required is one-man power. The accuracy of the measurement appears high. Repeat experiments usually agree to about 1 per cent.

"*Disadvantages of Method.*—The motion is not steady, but accelerated. The motion is not rectilinear. These two facts may cause the apparatus to give erroneous results, but it should be observed that when tests are made on forms tested by the N.P.L. the results are in very fair agreement. Only on some thick sections the results are not the same; on the other hand, Handley Page effects are very obvious.

"*Description of Method of Carrying out Test.*—The model is placed on the frame and run at varying angles for lift; the usual increments of angle are by 2. The model is then set at 0° incidence and run for initial drag. The model is then removed and replaced by weights, and the pendulum drag measured. The model is then replaced and the weights removed to check for initial drag, and if any discrepancy is noted the experiment is repeated. This test for initial drag is most important, and should be carried out with the greatest care. The model is then run through at varying angles for drag measurements.

"*Pressure Plotting.*—This can be carried out satisfactorily on this apparatus. When the necessary holes and passages have been made in the model they must be connected to a small tube carried up the pendulum. This tube is coupled up by means of a thin, flexible rubber pipe to a small inclined U tube filled with alcohol. If the tube is small the necessary mass of alcohol is reduced, and the inertia effect of this

mass also reduced. The pendulum is swung in the ordinary way and the motion of the alcohol noted. With practice this can be read to $\frac{1}{100}$ in., with a possible error of $\pm \frac{1}{100}$ in.

"A correction has to be applied for the centrifugal force of the air in the tube down the pendulum. When this correction is applied the results are in agreement with those obtained at the N.P.L. on the same section. The work is a little tedious, but a section can be plotted in one day and invaluable results obtained. These results show our want of a satisfactory theory. Progressive modifications of form do not produce the expected alterations of pressure, and no general conclusions can so far be stated.

"*Movements of Centre of Pressure.*—So far no attempt has been made to measure this quantity, as time and money have not permitted, but it does not seem impossible to devise an apparatus to carry out this work if necessary.

"*Further Possibilities.*—With the pendulum it is possible to observe to a certain extent the effect produced on the air by the passage of any body under test through it. For this it is necessary to create a smoke cloud and swing the model through it.

"Wing-tip vortices," he continued—"first, I think, suggested by Lanchester and later developed by Prandtl—can be observed. These vortices exist, but appear to be not quite as assumed by theory.

"The vortex is non-existent at the angle of no lift, and increases in size and probably in velocity up to the burple point, where the motion changes. With square-ended planes the centre of the vortex occurs on the line of the wing tips, but apparently below it. As far as can be observed the whole of the rotational effect is below the wing.

"With tapered wing tips the centre of the vortex comes in nearer the centre of the model, approximately one-sixth of the span, and the vortex obviously increases in size and apparently decreases in speed of rotation.

"With a biplane two vortices are formed which rotate separately and finally round one another; here the vortices appear smaller.

"The vortices persist for a long period after the passage of the model. They have been observed for 800 or 900-chord lengths.

"*Further Smoke Observations.*—When a model passes through the air a distinct kick is given to the air at considerable distances from the model; this is especially noticeable on the upper side, where the effect is visible up to 8 ft. from the model. What the nature of the kick is is not clear, but it looks like the first swing of a very heavily damped vibration. This may have a bearing on tunnel-wall effect.

"Finally," he concluded, "I should like to try and impress on you the effects that making experiments such as these have on anyone who undertakes them. One becomes impressed by the unsatisfactory nature of usually accepted theories when applied to observed facts.

"Turning to the practical side, the experiments, whilst at times apparently giving illogical results, continue to indicate the possibility of increasing the aerodynamic efficiency of the forms we use. Gliding angles of 1-18 are attainable, and probably much higher figures.

"The Handley Page effect shows the possibility of multiplying lifts by 3; unfortunately, it multiplies drag by 9. Does this not indicate that if we do right we can reduce the drag forces? To do this we must do something new and not copy. Every one who can should take this work up and experiment.

"The present aeroplane is wasteful of power, and for progress we must improve it."

PERSONALS

Married

Lieut.-Col. CUTHBERT EUAN CHARLES RABAGLIATI, late K.O.Y.L.I. and R.F.C., youngest son of Andrea C. F. Rabagliati, M.D., Whinbrae, Ben Rhydding, and grandson of the late Duncan McLaren, M.P., Edinburgh, was married on December 4 at St. Ethelburga's, Bishopsgate, to CLARISSA CATHERINE MELVILL DE HOCHÉPIED LARPEY, only daughter of the late John Melvill, ninth Baron de Hochepied, and of the Baroness de Hochepied.

Flight-Lieut. EDWARD THORNTON, R.A.F., only son of the late Edward Thornton, Minister in H.M. Diplomatic Service, and of Mrs. E. D. L. Harvey, was married on December 11, at St. Saviour's, Chelsea, to MARJORIE GABRIELLE, only daughter of Mr. W. R. PIKE.

To be Married

The marriage will shortly take place between RORY ALWYN MACNAMARA SCRASE DICKINS, late 60th Rifles and R.A.F.,

eldest son of Mr. and Mrs. Alwyn Scrase Dickins, of Heronskill, Hoiham, and BRENDA BAILLIE, of Tismans House, Rudgwick, Sussex, only daughter of Mr. and Mrs. SOUTHEY HEWITT.

Deaths

Capt. JOHN EVELYN HARRISON DAKIN, late Squadron-Commander, R.A.F., who died suddenly on December 8, in South Africa, aged 34, was the son of the late Joseph Harrison Dakin, of Brittany Lodge, Edwardes Square.

Flying Officer BERTRAND REGINALD HARRIS, R.A.F., of 56, Clifton Gardens, Maida Vale, W., died of pneumonia on December 10, at the Royal Naval Hospital, Chatham. Flying Officer Harris, whose age was 27, had been twice mentioned in Despatches.

Item

Lieut. AVIATEUR WILLY COPPENS, D.S.O., M.C., Air Attaché to the Belgian Embassy, left London on December 3, for Baghdad.

THE ROYAL AIR FORCE

London Gazette, December 8, 1922

General Duties Branch

The follg. Flying Offrs. are transfd. to the Reserve:—
Cl. A (Dec. 9):—R. C. Rodger, M.C., D.C.M.; W. W. Saunders.
Cl. B (Dec. 8):—G. H. Winckworth.

Memorandum.

The permission granted to Sec. Lieut. R. H. Stonnill to retain his rank is withdrawn on joining the T.A.; Oct. 24.

London Gazette, December 12, 1922

General Duties Branch

The following are granted permanent commns. as Flying Offrs., with effect from dates indicated. *Gazettes* of those dates, appointing them to short service commns., are cancelled:—A. W. Cuddon-Davis; January 30, 1920 (since promoted). Previously described as A. Bottoms). G. S. Oddie, D.F.C.; December 12, 1919 (since promoted). H. R. Junor, D.F.C.; December 12, 1919. S. D. MacDonald, D.F.C.; July 2, 1920. M. W. Nolan; September 12, 1919.

Flying Offr. E. R. B. Playford is granted permanent commn. in rank stated; August 25, 1920 (since promoted). *Gazette* August 27, 1920 appointing him to a short service commn., is cancelled; E. J. Kingston-McCloughry, D.S.O., D.F.C., is granted short service commn. as Flying Offr., with effect from and with seniority of December 5. Capt. G. S. Reed, O.B.E., late I.A.R.O., is granted short service commn. for three years on active list as Flight-Lieut., with seniority August 19, 1920; October 1. Pilot Offr. A. D. H. Foster to be Flying Offr.; October 28.

The following are transferred to the Reserve; December 12:—

Class A. Flying Offrs.—E. N. Fenton, J. T. Rogerson.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

Squadron Leaders: A. J. Miley, O.B.E., from Aircraft Depot, Egypt (Middle East), to R.A.F. Depot (Inland Area). (Supernumerary.) 22.11.22. H. G. Smart, D.F.C., from No. 6 Squadron (Iraq Command) to R.A.F. Depot (Inland Area). (Supernumerary.) 5.11.22. F. C. Williams, O.B.E., from Headquarters (Iraq Command) to R.A.F. Depot (Inland Area). (Supernumerary.) 5.11.22. E. A. B. Rice, M.C., from R.A.F. Depot (Inland Area) to command Air Pilotage School (Cadre) (Inland Area). 16.12.22. H. A. Mitchell, O.B.E., from No. 10 Group Headquarters (Coastal Area) to Headquarters, R.A.F. Middle East. 30.11.22. C. P. Ogden, O.B.E., from R.A.F. Depot (Inland Area) to Egyptian Group Headquarters (Middle East). 30.11.22. A. G. Higgins, from School of Technical Training (Men) (Inland Area) to No. 1 School of Technical Training (Boys) (Halton). 13.12.22.

Flight Lieutenants: W. H. Dolphin, from No. 2 Flying Training School (Inland Area) to Aircraft Depot, Egypt (Middle East). 24.11.22. H. Steele, from Army (R.A.M.C.) to R.A.F. Depot (Inland Area), (Supernumerary), on appointment to Permanent Commission as Quartermaster and Flight Lieut. (Medical), on transfer from the Army. 27.9.22. H. Steele, from R.A.F. Depot (Inland Area), to No. 1 Stores Depot (Supernumerary), for duty as Quartermaster (Medical) at the Medical Stores Depot. 27.11.22. H. E. F. Wyncoll, O.B.E., M.C., from R.A.F. School (India) to Headquarters, R.A.F., India (Supernumerary). 1.11.22. T. H. McDowell, from R.A.F. School (India) to Headquarters, R.A.F., India (Supernumerary). 1.11.22. W. G. L. Wambeck, from No. 5 Squadron (India) to No. 20 Squadron (India). 27.10.22. F. A. Norton, from No. 267 Squadron (Mediterranean) to H.M.S. "Ark Royal" (Mediterranean). 13.11.22. R. B. Munday, D.S.C., from Headquarters, Coastal Area to Seaplane Training School (Coastal Area). (Supernumerary.) 11.12.22. W. H. L. O'Neill, M.C., from No. 2 Flying Training School (Inland Area) to No. 100 Squadron (Inland Area). 11.12.22. C. E. W. Foster, from R.A.F. Depot (Inland Area) to R.A.F. Base, Leuchars (No. 205 Squadron) (Coastal Area). (Supernumerary.) 15.12.22. A. G. Taylor, A.F.C., from No. 5 Flying Training School (Inland Area) to No. 1 Flying Training School (Inland Area). 16.12.22. A. Rowan, from School of Naval Co-operation and Aerial Navigation (Coastal Area) to Headquarters, Coastal Area. 29.11.22. M. J. Cahalane, M.B., from R.A.F. Base, Gosport (Coastal Area), to Aeroplane Experimental Establishment (Coastal Area). 1.12.22. E. F. N. Currey, to Research Laboratory and Medical Officers' School of Instruction (Coastal Area). On appointment to Temporary Commission in Medical Branch. For short course of instruction. 29.11.22. W. P. Connolly, from Army (R.A.M.C.) to R.A.F. Depot (Inland Area). (Supernumerary.) On appointment to Permanent Commission as Quartermaster and Flight Lieutenant (Medical) on transfer from the Army. 13.10.22. W. P. Connolly, from R.A.F. Depot (Inland Area) to No. 1 School of Technical Training (Boys) (Halton). (Supernumerary.) For duty as Quartermaster (Medical) at Halton Hospital. 27.11.22. F. J. Powell, M.C., from No. 28 Squadron (India) to R.A.F. Depot (Inland Area). (Supernumerary.) 31.10.22. M. Thomas, D.F.C., A.F.C., from No. 30 Squadron (Iraq Command) to R.A.F. Depot (Inland Area). (Supernumerary.) 5.11.22. B. McEntegart, from No. 2 Flying Training School (Inland Area) to No. 4 Flying School (Middle East). 30.11.22. W. E. Hodgins, M.B., from Research Laboratory and Medical Officers' School of Instruction (Coastal Area) to Headquarters, R.A.F., India. (Supernumerary.) 1.12.22. R. G. J. McCullagh, from Air Pilotage School (Cadre) (Inland Area) to R.A.F. Depot (Inland Area). 11.11.22. A. E. Jenkins, from R.A.F. Depot (Inland Area) to Air Pilotage School (Cadre) (Inland Area). 11.11.22.

Class B. Observer Offrs.—H. Alexander, B. J. Malyan, D. H. Murray, A. L. Willcox.

Class C. Flying Offr.—L. J. Hoare.

Observer Offrs.—C. G. Boothroyd, D.F.C., G. R. Terry.

Flight-Lieut. R. J. O. Compston, D.S.C., D.F.C., is placed on half-pay, Scale B; November 29. Flying Offr. V. R. S. White, M.C., is placed on retired list on account of ill-health contracted on active service; December 13.

Stores Branch

Flying Offr. T. F. Beere is placed on retired list on account of ill-health contracted on active service; December 13.

Medical Branch

C. V. D. Rose is granted short service commn. as Flying Offr., with effect from and with seniority of November 27. E. F. N. Currey is granted temporary commn. as Flight-Lieut., with effect from and with seniority of November 29.

The following are granted permanent commissions as Quartermasters and Flight-Lieuts.:—W. P. Connolly; October 13. H. Steele; September 27.

Memoranda

The following are granted temporary commns. in ranks stated for duty under Directorate of Works and Buildings:—

Wing Comdr.—R. H. T. Jobson; November 1.

Flying Offrs.—J. J. O'Connor, S. J. Stocks, W. F. Langdon; April 1. L. H. Morgan-Browne; November 1. J. M. Morris; November 24.

Major R. Money, O.B.E., The King's Own Royal R., is granted the rank of Lieut.-Col., R.A.F., on retirement from the Army; August 17. Lt. H. Chaplin is deprived of permission to retain his rank on conviction by the Civil Power; August 19.

THE DUKE OF SUTHERLAND AND THE PILGRIMS

SPEAKING at a luncheon given by the Pilgrims to the American Commission for the Adjustment of Foreign Claims, the Duke of Sutherland, Under-Secretary of State for Air, in proposing the toast of the American guests, after paying a general tribute to what America did in 1917 to help the allied powers to victory in the greatest war that has ever ravaged the earth, referred more directly to their co-operation in the air.

"Had the result been a victorious Germany," the Duke said, "she would have shown us scant mercy. It was possible that under Democratic rule she had changed her heart with her coat, and might one day prove herself fitted to enter the Brotherhood of Nations.

"Be that as it may," the Duke continued, "that change of heart might never have come about had not America entered the field against her. It was in the air as well as on sea and land that America exerted her great sinews to help us. But in order to do this to the fullest advantage, it was necessary, in matters so technical as aerial warfare, that she should receive the full value of our experience and knowledge in regard to both aeroplanes and engines, and it was to this

end that our Government arranged that all our information should be at her disposal.

"On the entry of America into the War—April, 1917—the first thing she did was to send to this country officers of her Air Force to consult with our Air Board regarding the co-ordination of the aerial policies of the two Governments. At the head of this came Major Bolling. Let us recall the name of this man who did such good work at the time and carried through this agreement, and who afterwards made the supreme sacrifice for the allied cause, and now fills a hero's grave in common with many others of your countrymen.

"Today we welcome Colonel McMullen and the Hon. Harry Knight amongst us, and we charge them to carry to the relatives of Major Bolling the fact that today his name has been recalled in all honour amongst us. We know they will discharge their duties in the spirit of justice and equity that has always ruled the Anglo-Saxon race.

"I venture also to express the hope that the various claimants will co-operate and will welcome as they should the opportunity afforded them by the presence of the American Commission of having their claims settled here in London."

War Honours

In the *London Gazette* of December 19th it was announced that the King has approved of the following rewards for distinguished service in Kurdistan:—

Bar to Distinguished Flying Cross.

Flight-Lieut. W. H. Park, M.C., D.F.C.

Flight-Lieut. F. O. Soden, D.F.C.

Distinguished Flying Cross.

Flying-Officer S. T. B. Cripps.

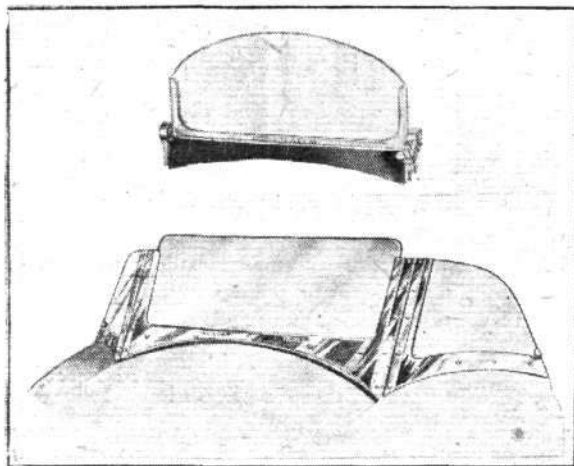
Flying-Officer G. D. Daly.

Junkers to Visit England

HERR JUNKERS, the famous German aeronautical engineer, whose daring designs and conceptions of all-metal aircraft are well known to readers, will give a lecture to the Royal Aeronautical Society (at the hall of the Royal Society of Arts) on Jan. 4. The subject will be "Metal Aeroplanes," Herr Junkers having specialised in this department, and having carried out exhaustive experiments which make him one of the greatest authorities on steel aeroplane construction in the world. His paper should be of great interest.

PROTECTING THE PILOT

IN our last issue some reference was made to the work of Auster, Ltd., of 133, Long Acre, London, and Birmingham, in devising shields for protecting the pilot from wind and rain. Necessarily in the limited space at our disposal then it was impossible to do more than refer to a few of the types. It must not be thought, however, that some of the better known and most popular types have been discontinued, that being far from being the case. Two of the designs which come in that category are now illustrated. They are, first,



Above, the Auster No. 1 screen for Avro machines ; below, the screen No. 52, for D.H.18 and 34 and other machines.

the simple and neat screen which has proved so successful in service on Avro and Bristol machines, which is appropriately known as Model No. 1 S.C., while the other one is used on the D.H.18 and D.H.34 and a number of other aeroplanes ; it has special hinged side wings, and is known as Model No. 52 S.C. Both of these shields have aluminium frames, and are fitted with unsplinterable Triplex glass.

Annual Dinner of No. 6 Wing, R.N.A.S.

THE fourth Annual Dinner of No. 6 Wing, R.N.A.S., Otranto, Italy, was held at the Connaught Rooms on December 9, when about thirty officers attended, the dinner being one of the most cheery so far organised. Wing-Comdr. Edmonds presided, and Admiral Mark-Kerr and Rear-Admiral Howard Kelly, under whose commands the Wing came, were present. After the presidential speech and "The King," Commander Beuttler, in his inimitable manner, proposed the health of "Absent Members," recalling, in a speech in which humour was blended with seriousness, the days spent in Italy. He was followed by Admiral Mark-Kerr, who delivered a striking speech on the need for development of our air services, and by Rear-Admiral Howard Kelly, who spoke of the necessity for co-operation between the Navy and the Air Force at the present time. Group-Comdr. Longmore and one or two other members also spoke, Major Morrison and Flying Officer Leslie causing much laughter by their anecdotes. The dinner ended earlier than in former years, in order that members might have more opportunity of talking over old times, and so was concluded another of the reunions, each of which seems more successful than its predecessor. It is hoped to hold the fifth of the Annual Dinners in December, 1923.

PUBLICATIONS RECEIVED

The English Dreyfus Case. By David Ockham, 15, Parseval Road, Hampstead, London, N.W. Price 1s. By Post 1s. 3d.
Commercial Art, No. 2, November, 1922. London: Commercial Art, 37, Drury Lane, W.C. Price 1s. 6d.
Official Gazette of the United States Patent Office, November 21, 1922. Washington: Government Printing Office.
Les Helicopteres. By W. Margoulis. Paris: Gauthier-Villars et Cie., 55, Quai des Grands-Augustins. Price 12f.
Woodworking Machinery Regulations, 1922. Statutory Rules and Orders, 1922, No. 1196. H.M. Stationery Office, Kingsway, W.C. Price 2d.
Handbook on Universal Camera Mounting Air Publication No. 913. Price 1s. By post 1s. 1d. *Rigging Notes, Aero Biplane, Type 504 K (100 h.p. Monosoupape).* Air Publication No. 916. Price 6d. By post 7d. London: H.M. Stationery Office, Kingsway, W.C. 2.

SIDE-WIND

L'Air, our brilliant French contemporary, is making a big effort to deal adequately with the Paris Aero Show. Several issues are being published dealing with all the exhibits, quite an unusual procedure in French journalism. These numbers can be had by readers who notify *L'Air* at their offices—5, Rue de l'Isly, Paris.

IMPORTS AND EXPORTS, 1921-1922

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; for 1918, see "FLIGHT" for January 16, 1919; for 1919, see "FLIGHT" for January 22, 1920; for 1920, see "FLIGHT" for January 13, 1921; and for 1921, see "FLIGHT" for January 19, 1922.

	Imports		Exports		Re-Exportation	
	1921.	1922.	1921.	1922.	1921.	1922.
Jan. ...	£ 4,459	£ 1,152	£ 87,128	£ 76,552	£ 2,285	£ 23
Feb. ...	2,379	567	59,829	69,129	19	1,100
Mar. ...	14	1,471	118,199	166,607	1,565	100
April...	1,370	3,846	138,983	139,995	450	5,880
May ...	3,350	2,416	59,624	167,999	1,818	4,254
June ...	5,181	816	79,713	129,137	—	14,530
July ...	540	1,039	530,628	24,405	860	—
August	343	198	111,595	88,910	—	685
Sept. ...	620	3,043	145,755	71,508	—	44
Oct. ...	4,256	633	101,567	40,225	580	90
Nov....	504	52	144,073	203,437	20	450
	23,016	15,233	1,577,094	1,177,904	7,597	27,156

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1921

Published December 14, 1922

- 13,901 S. A. REED. Air propellers. (163,714.)
- 16,083. VICKERS, LTD., and J. WEARHAM. Velocity or direction indicators. (188,696.)
- 19,002. J. H. W. GILL. Screw propellers. (188,717.)
- 28,703. A. H. F. FEDDEN, L. F. G. BUTLER and BRISTOL AEROPLANE CO., LTD. Starting devices for I.C. engines. (188,923.)
- 30,470. W. T. REID and BRISTOL AEROPLANE CO., LTD. Emergency discharge valves. (188,949.)
- 30,581. G. BREWER (KRUPP AKT.-GES.). Projector lamps. (188,952.)

APPLIED FOR IN 1922

Published December 7, 1922

- 16,081 and 16,268. SKYING AIRCRAFT CORPORATION. Ignition. (181,374 and 181,387.)
- 28,389. A. L. DAVIS. Aircraft lamps. (188,625.)

Published December 14, 1922

- 7,738. V. SPETESCU and MAGNET MOTOREN AKT.-GES. Air-cooled cylinders. (177,510.)

Published December 21, 1922

- 15,767. SKYING AIRCRAFT CORPORATION. Electric ignition devices for I.C. engines. (181,358.)

Owing to the Christmas Holidays FLIGHT will be published on Friday next week instead of Thursday.

FLIGHT

The Aircraft Engineer and Airships

36, GREAT QUEEN STREET, KINGSWAY, W.C. 2.

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Telephone: Gerrard 1828.

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